

Curtin Business School

Curtin Graduate School of Business

Transition from Technical Engineer to Managers and Leaders: Women's
Experience in Australia

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Declaration

To the best of my knowledge and belief this thesis contains no material published by any other person except where due acknowledgement has been made.

This thesis contains no material that has been accepted for the award of any other degree or diploma in any university.

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number #GSB-06-09.

Signature: 

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Abstract

This research explores the lived experiences of women engineers who have advanced to senior roles, specifically those of manager and leader, within technical organisations in Australia. An apparent paradox between my own experiences as an engineer and manager and prevailing discourse describing the engineering profession as an uncomfortable and difficult place for women prompted a desire to understand the experiences of other women engineers who had advanced to positions of influence in their careers.

Using a qualitative methodology, informed by phenomenological and feminist perspectives, this research uncovers of women engineers' conceptualisations of management and leadership and their experiences of transition to manager and leader. Women engineers view management and leadership functions as integral to, rather than distinct from, engineering work. Delivering engineering capability is achieved through a wide range of multi-faceted organisational roles, using a highly relational approach. The *Transition Continuum Model* has been developed to explain the ongoing and often unresolved nature of women engineers' transitions to manager and leader. This model shows their transitions as occurring over external, internal and temporal dimensions shaped by an interplaying triad of individual, relational and structural influences. The *Transition Continuum Model* demonstrates that to understand women engineers' transitions to manager and leader, the multiple dimensions of and influences on their experiences must be considered together as dynamic system.

The study provides a gendered account of women's progression to management and leadership roles within the engineering profession, not previously reported. It adds to the current understanding of women's careers and experiences of advancement within the engineering profession, and to the broader field of work-role transition. The findings inform implications for organisations and individuals with an interest in increasing women engineers' representation in positions of influence.

1 Introduction

The starting point for this thesis was an interest in women's careers in the engineering profession. My own experience as a woman engineer and manager in the Western Australian resources sector and my involvement in organising and leading 'women in engineering' networks provided first-hand insight into women engineers work experiences.

Through my role as a committee member and subsequent Chair of Engineers Australia's women in engineering group in Western Australia, I became very familiar with the statistics marking the minority status of women in the engineering profession in Australia and the associated reasons for this. I volunteered enthusiastically with Engineers Australia to support women in the profession, engaging with school-aged girls, university students and men and women working in industry and higher education.

At times, my own positive experience of working and progressing as a professional engineer in industry contrasted with my cause. In particular, the prevailing discourse around women's attrition from the profession and lack of opportunities for women's advancement did not align with my own experience or my observation of other women engineers pursuing successful careers. The contrast of these experiences prompted my interest in investigating the experiences of other women engineers who had advanced to positions of influence in their careers.

Exploration of the current understanding of women engineers' advancement to management and leadership roles revealed that little is known about women engineers' career advancement and their experiences in senior roles. As such, the primary aim of this research was to contribute to the understanding of women's experience of becoming a manager and leader in the engineering profession and to extend the understanding of women's careers in engineering to include positions of management and leadership.

The research question that drove this enquiry was: “How do women engineers transition into managers and leaders in technical organisations?” This question aimed to achieve the following objectives:

- Understand the experience of transition to manager and leader for women engineers
- Understand how management and leadership in technical organisations is conceptualised, from the perspective of women engineers
- Uncover the factors that affect the transition to manager and leader for women engineers
- Identify implications for practice to advance women in engineering

To achieve the research aims, a qualitative approach, guided by phenomenological and feminist theoretical perspectives, was taken. The phenomenological perspective focused the research on the phenomenon of movement into management and leadership roles. Consideration of this transition as experienced by the study participants placed their accounts and stories at the centre of the research. A feminist perspective acknowledged the gendered nature of the women’s experiences as professionals in a male-dominated and highly masculine profession and the absence of their perspectives from the current understanding advancement in the engineering profession.

Through its focus on successful transitions and embedded in a philosophy of “what can we learn from the experiences of these women?”, the intent of this research was to make women’s experiences of transition visible, inform a more inclusive view of management and leadership in engineering, and to use this knowledge to shape organisational and individual practices to increase women engineers’ participation in senior roles.

The research findings indicate that as managers and leaders, women engineers hold a wide range of complex and multi-faceted organisational roles, characterised by relational, organisational and technical tasks. Management and leadership in engineering is portrayed as delivering a capability, through a highly relational approach and with an enduring connection to and performance of

technical work.

This research proposes that women engineers' transition to manager and leader can be conceptualised as an ongoing process, experienced across three dimensions: the external experience relating to organisation role change, often extending over a series of organisational roles in multiple-directions; the internal experience of adjustment and identification; over time, extending well before and beyond appointment to a managerial or leadership role. The experience of transition is shaped by a triad of interacting individual, relational and structural factors. A conceptual model – the *Transition Continuum Model* – is proposed to capture the complex, ongoing and often unresolved nature of women engineers' transitions to manager and leader.

This structure of this thesis reflects the evolution of my research interest into a defined research problem situated in the extant literature. The development of the approach taken to answer the research problem, the findings and their significance follow.

Chapter 2 provides the context of this research by examining aspects of working life that are relevant to women in the Australian engineering profession. Women engineers in Australia work within the broader context of the evolution of women's participation in the workforce. This chapter begins with a review of the rise of women's workforce participation, including increased access to and participation in management and leadership positions, and entry into traditionally male occupations and industries. The chapter then shifts focus to the engineering profession in Australia, providing the professional context relevant to women in this study. The persistent minority, gendered employment patterns and concerns that characterise women's participation in the Australian engineering workforce are discussed. The chapter concludes with a summary of key issues and initiatives relating to the advancement of women engineers within Australia.

Chapter 3 reviews literature that is relevant to women engineers' experiences of career advancement. The chapter lays foundation for the research and enables

definition of the research problem. The progression of women engineer's careers and their advancement to managers and leaders is located at the intersection of several existing research areas relating to the engineering profession and management and leadership. As such the chapter is organised into three major areas of women in the engineering profession, women's advancement to management and leadership roles, and becoming a manager and leader in the engineering profession.

Chapter 4 discusses the methodological issues and research design. The development of the enquiry framework is detailed, and the connection between the research question and enquiry framework is established. The chapter concludes with a description of the procedural aspects of the research, and their implementation.

The findings of the research are presented in Chapters 5 and 6. Chapter 5 presents a demographic description of the participants and explores the managerial and leadership roles occupied by the study participants. This provides an understanding of how the women perceive their roles as managers and leaders and the qualities required to successfully reach and perform these roles. Chapter 6 provides a portrait of the experience of transition to manager and leader for women engineers, drawing on key themes that emerged from data analysis and highlighting common elements and points of difference amongst the women's experiences.

Chapter 7 presents a discussion of these findings and their points of intersection and contrast with existing literature. The *Transition Continuum Model* formed from the synthesis of the findings presented in Chapters 5 and 6 provides a framework for this discussion. This model illustrates the women's experience of transition and expresses the complexity of their experience.

The thesis concludes in Chapter 8. The contributions of this study are summarised. A critique of the research approach highlights the limitations. Implications for practice based on the findings of the research are discussed. The chapter closes with an outline of areas of possible future research.

2 Establishing the Research Context

2.1 Introduction

The focus of this research is the advancement of women engineers to management and leadership roles in technical organisations in Australia. This chapter establishes the context of this study by focusing on aspects of working life that are relevant to women in the Australian engineering profession. The key areas covered in this chapter are illustrated in Figure 2.1.

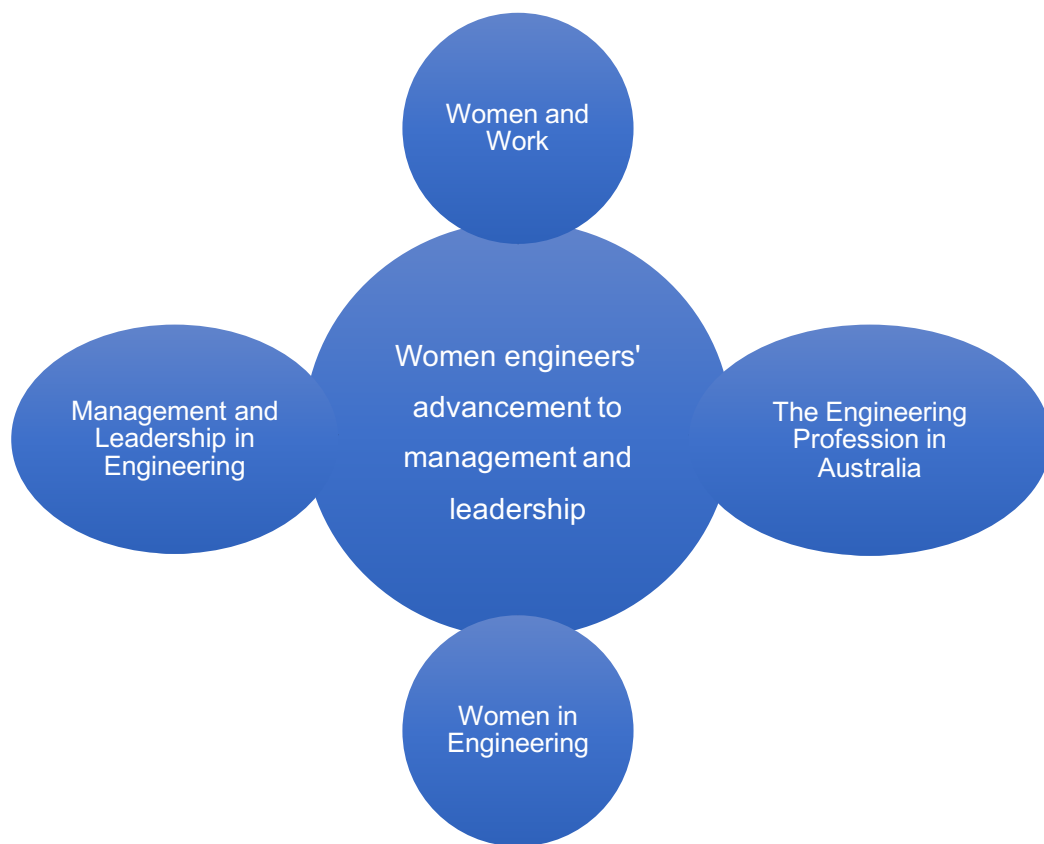


Figure 2.1 – The Context of Women Engineers' Advancement to Management and Leadership

Women engineers in Australia work within the broader context of the evolution of women's participation in the workforce. This chapter begins with a review of the rise of women's workforce participation. This includes increased access to and participation in senior roles including management and leadership positions within organisations, and entry into traditionally male occupations and industries. Key legislation accompanying and stimulating women's entry into

work is described and the current profile of women's workforce participation is presented.

This is followed by a review of the demographics of Australia's engineering workforce, the types of roles and the employing industries, and a brief exploration of current issues and trends within the profession. The typical career paths observed within the engineering profession are described, as a preface to entry to management and leadership roles. This provides an understanding of the professional context relevant to women in this study.

The chapter then shifts focus to the persistent minority, gendered employment patterns and concerns that characterise women's participation in the Australian engineering workforce. A summary of key issues and initiatives relating to the advancement of women engineers within Australia is provided.

Where cited, statistics relate to the period of 2006 to 2011. This corresponds to the period of the two most recent Australian Census of Population and Housing (Australian Bureau of Statistics, 2016) during which the data collection for this research took place.

2.2 Women and Work

This section describes women's participation in the Australian workforce over the past decades, including employment in male-dominated occupations and industries, and in management and leadership positions.

2.2.1 The Rise of Women's Workforce Participation in Australia

Women's participation in the Australian workforce has increased markedly since the 1970's, a decade characterised by activism, social liberalism and changes in social attitudes towards women's paid work (Strachan, 2010). The third wave of the women's movement and increased momentum for workplace equality were paralleled by the introduction of anti-discrimination legislation at federal and state government levels. The Sex Discrimination Act 1984 prohibited "discrimination on grounds including sex, relationship status, pregnancy,

parental status, breastfeeding, family responsibilities” in areas of public life including workplaces (Australian Human Rights Commission, 2017). The effect of this legislation and accompanying state based legislations was to remove overt discrimination against women. The ‘complaint based’ nature of the legislation, requiring initiation of action by an affected individual posed some limits on the practical implementation of the legislation’s requirements (Thornton and Luker, 2010).

Women’s increased but unequal participation in the workforce stimulated the development of the Affirmative Action (Equal Employment for Women) Act 1986 (replaced by the Equal Opportunity for Women in the Workplace Act 1999 and the Workplace Gender Equality Act 2012). This legislation and its subsequent revisions placed the onus on non-public sector organisations with 100 or more employees to take steps to provide equal opportunity in employment for women and to report annually to the associated agency (Workplace Gender Equality Agency, 2013).

Measurement and reporting of gender diversity within Australian organisations was further reinforced by the modification of the Australian Securities Exchange (ASX) Corporate Governance Principles and Recommendations in 2010 to include recommendations relating to diversity. Applying to all listed entities on the ASX, the changes required corporate boards of listed organisations to:

- establish a diversity policy, including establishing and monitoring measurable objectives for achieving gender diversity, and to publicly disclose this policy;
- disclose the organisations measurable objectives for achieving gender diversity and associated progress in the annual report;
- disclose the proportion of women employed within the organisation, in senior executive positions, and on the corporate board; and
- disclose the mix of skills and diversity that the board is looking to achieve in the membership of the board (Grace, 2010).

Measures such as equal employment legislation have not significantly impacted employment equity, with women persisting in lower levels of organisations, and dominating part-time and casual worker groups (Gaze, 2012). At the time of preparing this research project, women's participation rate in the Australian labour force was 59%, comprising 46% of the paid workforce (Australian Bureau of Statistics, 2008). This workforce profile is similar to those of other advanced industrialised nations (US Department of Labor Bureau of Labour Statistics, 2008; Workplace Gender Equality Agency, 2016b). In Australia, women of working age are recognised as an under-utilised resource whose participation is vital to the continued growth of the Australian economy (Equal Opportunity for Women in the Workplace Agency, 2008b). Their increased participation is proposed as a solution to addressing labour market shortages (Toohey et al., 2009).

Gendered stratification by industry, occupation type, position status and mode of employment is present. Australian women work across a variety of industries, but they are concentrated in a narrow selection and are commonly found in positions with lower status than men in the same industries and occupations (Cohen, Broschak, & Haveman, 1998; Preston & Whitehouse, 2004). Women are predominant in the Health Care & Social Assistance, Education & Training and Retail sectors (Toohey, Colosimo, & Boak, 2009), but are a small proportion of the workforce in construction (12%), mining (15%), and the transport, postal and warehousing industries (21%) (Australian Bureau of Statistics, 2012).

Women's levels of participation in full-time work have not changed greatly in the past 30 years (Simon-Davies, 2013). Women are more likely than men to work part-time with 45% of employed women in Australia utilising part-time working arrangements (Australian Bureau of Statistics, 2010).

Women's opportunity for leadership, particularly in management and the professions, has increased with the participation of women in the workforce, Women occupy over 44% of management and professional positions in Australia, however are underrepresented at senior and executive levels of organisations

(Equal Opportunity for Women in the Workplace Agency, 2010). This theme is further explored in section 2.2.3.

2.2.2 Women in Non-traditional Occupations and Industries

The increase in the number of women in paid employment has facilitated the entry of women into industries and occupations that are described as non-traditional. This typically encompasses types of work which are, or have historically been undertaken by men (Bagilhole, 2002). While present in these professions, women are underrepresented in number and status. From Kanter's (1977) work on proportion and group interaction, a group constituting less than 15% of a profession may be termed 'token' aside a numerically dominant group who control the profession and its culture. Women in non-traditional employment fit this profile and the experience of these women is shaped by the perceptions and interactions between the dominant and token groups i.e.: men and women, and the masculine culture.

The experience of women in non-traditional employment is characterised by issues specific to working in a largely male environment (McIlwee & Robinson, 1992) in addition to issues common to employed women generally. Concerns include slow career progression (Bennett, Davidson, & Galeand, 1999), lower remuneration, and clustering in lower-status specialties (Bagilhole, 2002). A Barriers to increasing the proportion of women in non-traditional fields include difficulty in accommodating work and family responsibilities in an overtly masculine culture in which values of long working hours, competition and full-time working are the norm (Bennett et al., 1999; Greed, 2000; Menches & Abraham, 2007).

Considerable effort has been made by government, industry bodies and organisations to increase the number of women pursuing careers in male-dominated areas of work for reasons of equity and importance of diversity to progress and innovation (Blickenstaff, 2005; Galloway, 2004; Toohey et al., 2009). Despite this, the pathways to and through careers in areas such as science, engineering and mathematics have been described as 'leaky pipelines' with a

gendered filter (Blickenstaff, 2005). Further discussion of the efforts specific to women in the engineering profession is presented in section 2.6.

2.2.3 Women as Managers and Leaders

At the time this research was undertaken, women were a minority in the top corporate positions in companies listed on the Australian Securities Exchange (ASX) holding 2.5% of board chair positions and 8.4% of board directorships within ASX 200 companies¹. Further, 3% of CEOs and 8% of Executive Managers were women (Equal Opportunity for Women in the Workplace Agency, 2010). More recent data shows that women's representation at corporate board level has improved from these levels but there is concern that progress has stalled (Australian Institute of Company Directors, 2017).

The Gender Equality Scorecard produced by the Australian government's Workplace Gender Equality Agency (WGEA) provides a "comprehensive picture of gender equality in workplaces in Australia" (Workplace Gender Equality Agency, 2015). The most recent scorecard issued in November 2016 provided a representation of the women in management and leadership pipeline across a range of industries within Australia, presented in Figure 2.2.

¹ ASX 200 is a benchmark index referring to the largest 200 companies listed on the Australian Securities Exchange by market capitalisation (Australian Securities Commission, 2016)

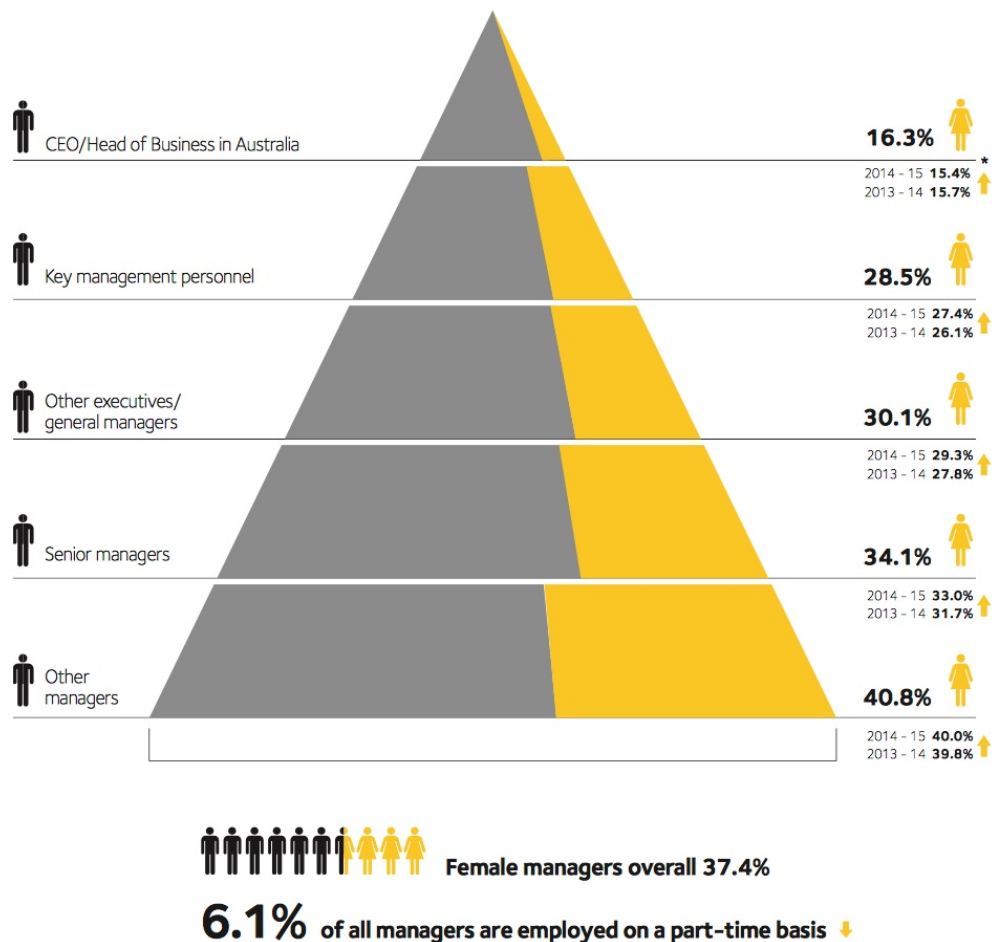


Figure 2.2 – The Proportion of Women in Management in 2016 (Workplace Gender Equality Agency, 2016a)

The figure clearly shows declining representation of women with increasing seniority. This is supported by WGEA analysis indicating that a large number of organisations have no women in the top tiers of management (Workplace Gender Equality Agency, 2015). Women’s managerial advancement been associated with ‘concrete wall’ and ‘glass ceiling’ metaphors, implying that impenetrable barriers exist (Eagly & Carli, 2007). However, paths to the top do exist and women have successfully travelled these paths. Women are equally as ambitious as men and opportunities for learning, development, promotion and progression are high priority (Equal Opportunity for Women in the Workplace Agency, 2008a; Hrdlicka, Cottrell, & Sanders, 2010). The metaphor of the labyrinth of leadership proposed by Eagly and Carli (2007) describes the convoluted, challenging but achievable advancement journey.

The prevalent arguments for increasing the proportion of women in management and leadership positions include moral and economic perspectives. Alvesson and Due Billing (2009) summarise four stances, presented in Table 2.1.

Table 2.1 - Arguments for Increasing Women's Representation in Senior Roles

Position	Summary
Equal Opportunities	Women do not have the same career opportunities as men, and have issues with advancing above lower managerial levels.
Meritocratic	The lack of women in senior roles is viewed as “inefficient human resources management” (ibid p. 169).
Special Contribution	Women have the potential to make important contributions to organisations because of their differences from men.
Alternative Values	The lack of women is due to the misalignment between their values and priorities (which are vastly different to those of men) and the values and priorities associated with managerial and leadership roles.

A popular argument is that of the ‘business case’ for women in senior roles, which links diversity efforts with business goals and financial outcomes (Catalyst, 2004). A recent meta-analysis of 78 studies relating to this perspective highlighted inconclusive findings and suggested alternative approaches to linking the relationship between women’s leadership and organisational performance be investigated (Hoobler, Masterson, Nkomo, & Michel, 2016).

2.3 The Engineering Profession in Australia

This section provides the context of the engineering profession within Australia. and commences with a description of the demographics of the profession. A review of current issues and trends provide an insight into complexity and heterogeneous nature of the engineering profession in Australia.

2.3.1 Engineers in Australia

Engineering is a profession, as opposed to an occupation (Kaspura, 2014). Members of the profession or 'engineering team' include professional engineers, who typically hold a Bachelor of Engineering degree, and engineering technologists and officers, who hold lesser qualifications. Unlike other professions in Australia such as medicine, dentistry and law, and in contrast to the engineering profession in the USA and Canada, the professional status of engineers is not legally defined, i.e.: registration, chartership or licensing is not required in Australia.

The primary professional body for engineers in Australia is Engineers Australia, comprising over 100,000 voluntary members. For individuals, the organisation provides a mechanism for achieving chartered status, professional development, and skills assessment for internationally qualified engineers. The National Engineering Register is an elective facility for registration provided by Engineers Australia (Engineers Australia, 2016b). For education bodies, Engineers Australia is responsible for professional accreditation of engineering education programs.

Statistics regularly compiled by Engineers Australia indicate that at the 2011 Australian census² there were over 263,000 qualified engineers active in the labour market in Australia (Kaspura, 2014). The number of qualified engineers in Australia had increased from the prior census in 2006, with the proportion of women engineers increasing slightly more than men. However, engineering remains a male-dominant profession, with the percentage of women engineers in the engineering labour force at 12.4% as of 2016. Women's participation in the engineering profession is addressed in section 2.5.1.

Engineers in Australia are specialised in a wide range of engineering disciplines. The Australian Bureau of Statistics (ABS) Australian Standard Classification of

² A more recent Australian census was conducted in 2016. Statistics from this census were not yet available at the finalisation of this thesis in 2017 (Kaspura, 2017).

Education (ASECD) categorises over 50 detailed engineering streams, and there are over 35 different technical societies affiliated with Engineers Australia. Of the engineering streams noted in the ASCED structure, more than half employ less than 1000 engineers, highlighting the diversity of technical speciality within the Australian engineering profession (Kaspura, 2014).

2.3.2 What is Engineering?

Explaining what engineering is, and thus what type of work engineers may be engaged in, is complex. Recent research exploring engineering practice (for example: Sheppard, Colby, Macatangay, and Sullivan (2006), Trevelyan (2010)) and commentary regarding the public's perception of engineering (UNESCO, 2010) suggest that the answer is not clearly understood nor easy to provide.

Engineering is considered critical to Australia's economy and "a key component of the nation's innovation system" (King, 2008, p. ii). Engineers are described as professionals that "conceptualise, create and maintain" systems, products and assets or as enablers, optimisers, problem solvers and innovators (Kaspura, 2014; King, 2008). Activities relating to design or applied science are often used to define engineering work, however, Trevelyan (2010) argues that engineering should be conceptualised beyond the "traditional narratives that focus just on design and technical problem solving" (p. 1). Mills, Franzway, Gill, and Sharp (2014) argue that the highly masculine image of engineering work stems from its association with machinery, construction and heavy work.

Current models of engineering practice (Sheppard et al., 2006; Trevelyan, 2010; Williams & Figueiredo, 2011) acknowledge the role of problem-solving and specialised knowledge, but also perceive the social dimension of engineering as imperative to achieving required outcomes. Trevelyan (2010) suggests "reframing engineering as a human social performance" (p. 13), while Sheppard et al. (2006) note that "engineering ... ought to improve the world for the common good" (p. 430). A recent report by UNESCO on engineering and development summarises the connection between science, engineering and human needs:

“Engineers use both scientific knowledge and mathematics on the one hand to create technologies and infrastructure to address human, social and economic issues, and challenges on the other. Engineers connect social needs with innovation and commercial applications” (UNESCO, 2010, p. 25)

A further concept used to define engineering is the way of thinking that engineers bring to their work, described as engineering judgement. This is deemed as a systematic, critical perception that enables engineers “to question current thinking and conceptualise alternative approaches” (Kaspura, 2014, p. 2).

The diversity of the profession highlighted in Section 2.3.1, and the difficulty in defining engineers and engineering work, influences public perception of engineering and the desirability of the profession as a career. A commonly held view is that the profession and its work are largely “invisible to the public” (King, 2008, p. 80) and without the status of medical, legal and accounting professions. King (2008) recommends that the public perception, profile and status of engineering be raised by “increasing the visibility of the innovative and creative nature of engineering and the range of engineering occupations that contribute to Australian’s prosperity, security, health and environment” (p. iv). This was the goal of the ‘Make it So’ public awareness campaign spearheaded by Engineers Australia (Engineers Australia, 2010) and their Year of the Humanitarian Engineer (Engineers Australia, 2011a), which aimed to change the public image of engineering.

2.3.3 Where and How Engineers Work

As indicated in section 2.3.1, engineering employment within Australia is diverse. Kaspura (2014) remarks “the training and experience of engineers offers transferable skills that are highly valued in many other fields of work” (p. 1). At the 2011 census, approximately two thirds of those with engineering qualifications were engaged in engineering occupations. The remainder was employed outside of engineering in “a wide range of analytical and problem solving work” (Kaspura, 2014, p. 14). A substantial proportion of qualified

engineers choose not to work in the profession, or leave it at some point in their working lives.

For those that are employed within ‘engineering occupations’, statistics indicate that engineers are employed in nearly every industry within the Australian economy. Drawing on the ABS Australia and New Zealand Standard Industry Classification (ANZSIC), the primary industries for engineering employment in Australia at the 2011 census included:

- Architectural, Engineering and Technical Services (15.3% of employed qualified engineers);
- Computer System Design and related services (4.7%); and
- Machinery and Equipment Manufacturing (4.5%).

Regional differences are seen in industry employment patterns, with industries subject to large media attention including Mining, and Oil and Gas Extraction dominant in Western Australia and Queensland, while less prevalent in other states. For example: Metal Ore Mining is the 12th largest employer of qualified engineers at a national level, but ranks 2nd in Western Australia (Kaspura, 2014).

Qualified engineers occupy a variety of positions, ranging from graduate to executive level positions. Engineering work is commonly team-based and that professional engineers are “expected to be the leaders of engineering teams and of the profession, and undertake a diverse range of responsibilities and roles” (King, 2008 p. 19). Engineering teams are frequently temporary due to project-based work, characterised by a cycle of intense work followed by dispersion of project teams. Project work creates opportunities for project management within engineering (King, 2008), however the transitory nature of this work can create intermittent employment and retention issues (Kaspura, 2014).

The majority (83%) of employed engineers work full-time. Part-time work is available and is increasing in incidence, but the uptake is lower than that of other skilled workers. Employment modes such as rotational “fly-in, fly-out”, and “drive-in, drive-out”, and shift work are prevalent in industries operating in

remote or offshore areas such as mining, oil and gas and construction (Storey, 2001).

2.3.4 Skill Shortage and High Demand

From the mid 2000's the Australian economy underwent a concurrent increase in activity in the resources and infrastructure sectors. The resources boom, driven by increased demand for steel and energy from Asia and rising commodity export prices, resulted in increased sector investment and a rise in demand for labour (Bishop, Kent, Plumb, & Rayner, 2013). In particular, substantial growth was seen in the iron ore, coal and liquefied natural gas (LNG) sectors.

The Australian mining industry was predicted to require over 70,000 additional employees in the period 2006-2015. Expected employee shortages were focused on non-professional tradespeople and semi-skilled workers, however a requirement for an additional 20,000 professional employees was also forecast, peaking during 2006-2010. At the same time, a large number of infrastructure projects were commissioned within Australia, many of which were related to the resource boom (Lowry, Molloy, & Tan, 2006).

A shortage of engineers resulted from the concurrent industry booms, and was exacerbated by recruitment and retention issues and retirement of engineers. The supply of local Australian engineers was unable to meet the demand. An increase in skilled migration was utilised to address the shortfall. From 2006 to 2011, skilled migration supplied over 70% of the additional qualified engineers. Kaspura (2014) described as "a heavy reliance on skilled migrant engineers in recent years" (p. 13). The rate of influx of migrant engineers was such that by 2011, the majority of degree-qualified engineers working in Australia were overseas-born.

2.4 Management and Leadership in Engineering

This section begins with a review of identified career paths within the engineering profession. While modern career paths are available to engineers, most engineers do become managers in the course of their careers.

2.4.1 The Dual Career Ladder

Engineering is regarded by some as dual path profession, with career progress viewed as either vertical movement into management or horizontal movement into a technical specialisation (Zabusky & Barley, 1996). The “dual career ladder” proposed by Allen and Katz (1986) describes this pattern within engineering careers. The managerial career path is typically associated with career success, status and remuneration (Ismail, 2003). Others prefer a technical path, choosing to remain close to technical work and to pursue increasing technical specialisation towards expert status.

Floyd and Spencer (2014) describe encountering the dual ladder as a decision point for engineers, requiring a choice to continue pursuing technical roles or move to the management path. Several authors have suggested that the dual “technical” and “managerial” paths are not the sole options for engineers. Alternative pathways exist and are necessary to capture aspects of engineering work and the variety of career orientations amongst technical professionals (Igbaria, Kassicieh, & Silver, 1999; Tremblay, Wils, & Proulx, 2002).

2.4.2 Alternative Career Paths

Alternative career paths identified include project-based, hybrid, entrepreneurial and transitory routes. The project-based career path (Allen & Katz, 1992) describes a career that moves from project to project, as opposed to following an upward managerial or technical trajectory. This pathway involves participating in a series of projects and a broadening of technical skill, rather than developing a specific line of technical expertise (Tremblay et al., 2002). The project-based career path may be less desirable for engineers, as it is not associated with advancement (Bailyn, 1991).

The ‘hybrid’ career has been proposed as an alternative to the existing “few, rigidly defined career paths” (Bailyn, 1991 p. 13) for engineers. The hybrid career encompasses aspects of recognised pathways including managerial, technical and project-based paths, and enables people to move through different career routes using temporary or multiple work assignments. Gaining experience on

both rungs of the dual career ladder may be a recipe for success (Floyd & Spencer, 2014).

In the Canadian context, Kennedy (2009) found that many engineers chose to leave engineering careers altogether, supporting patterns observed in Australian labour force statistics. Engineers may follow an entrepreneurial path and leave organisations to start their own businesses. Others may exit the profession temporarily and adopt transitory career paths (Srou, Abdul-Malak, Mona Itan, & Sidani, 2013; Tremblay et al., 2002).

Tremblay et al. (2002) explored the determinants of five career pathways, including the alternative pathways overviewed above. The authors found that in practice, pathways are not clearly distinguishable. This points to the blurring of distinct managerial career paths within engineering, and suggests that management is an important aspect of engineering work. Although a technically focused profession, day to day engineering work involves both technical and non-technical skills of which technical coordination, communication and social skills, along with technical expertise, are of importance (Trevelyan, 2007).

2.4.3 Careers in Engineering Management and Leadership

While a variety of modern career paths are available to engineers, the majority of engineers do become managers in the course of their careers (Badawy, 1981; Seethamraju, 1997). Recent research examining the career pathways of engineering management postgraduates found that 80% of participants occupied managerial positions during their career (Srou et al., 2013). On average engineers work in technical roles for five years prior to becoming managers (Lannes III, 2001).

Pathways to manager are varied. Srou et al. (2013) revealed 26 different career paths amongst 42 engineering management graduates, emphasising the range of role types, timing and direction of moves within and between organisations that constitute modern engineering management careers. note that Project management is becoming a common pathway for technical specialists, with the

increase in “projectification” of work and organisations (Hodgson, Paton, and Cicmil, 2011).

In Australia, engineers are recognised as active participants in and leaders of business, innovation and change. The College for Engineering Leadership and Management (CELM) was established by Engineers Australia in 2002 to enhance professional opportunities for engineers by developing, recognising and promoting their abilities in the business arena (Engineers Australia, 2016a). Further, the professional body offer the Engineering Executive (EngExec) post-nominal and chartership for members pursuing management and leadership opportunities and satisfying competency requirements set by CELM.

2.5 Women in Engineering in Australia

This section focuses on women’s participation within the engineering profession in Australia. A summary of the concerns identified by women engineers as influential to their retention and advancement within the profession is provided.

2.5.1 Women’s Participation in the Australian Engineering Profession

The minority status of women in the engineering profession is well documented. In the 2011 Australian census, the proportion of women with engineering qualifications recognised by Engineers Australia³ was 12.8%. Women with engineering qualifications were less likely than men to participate in the engineering labour force⁴, or to work in engineering occupations⁵. Only 38% of women with recognised engineering qualifications were employed in

³ Individuals holding recognised engineering qualifications are referred to as the ‘Engineering Population’ and represent the potential supply of engineers within Australia (Kaspura, 2013).

⁴ The ‘Engineering Labour Force’ represents the actual supply of engineers within Australia and is defined as those employed, or unemployed but seeking full-time or part-time employment (Kaspura, 2013).

⁵ Engineering occupations are defined as those included in 52 of 357 four digit occupations within the ABS Australian and New Zealand Standard Classification of Occupations (ANZSCO)(Kaspura, 2013).

engineering occupations; this was notably lower than the 60% of men (Kaspura, 2013).

The modest change in women's participation in the engineering profession over the period 2006 to 2011 is reflective of their static engagement in the profession over the past 20 years. There has been minimal shift in their involvement and a slight decline in female engineering student numbers following a notable increase in the proportion of women engaging in and completing engineering qualifications during the 1980's and 1990's (Burrowes, 2007).

Women's low participation rate is attributed to their limited enrolment in engineering courses and high attrition rate once in the workforce (Kaspura, 2012). The gendered difference in the proportion of qualified engineers working in engineering occupations is indicative of retention issues for women engineers in engineering. Professionals Australia (formerly APESMA) quantified the attrition rate of female engineers to be near to 40% greater than their male counterparts, with over 30% of surveyed women working in science and engineering expecting to leave their profession within five years (Rickard & Crowther, 2015). These issues will be further explored in section 2.5.3; academic literature exploring these issues is discussed in section 3.3.

2.5.2 Gender Differences in the Australian Engineering Workforce

Gendered patterns within the Australian engineering population are of relevance to this research. The first is the age profile, the second is the country of origin of women engineers, and the third is their employment patterns.

2.5.2.1 A Young Age Profile

The female Australian engineering labour force is characterised by a young age profile, with almost 50% of women engineers aged under 35 years old, compared to 30% of male engineers (Kaspura, 2013). Given that the number of women engineers entering the workforce annually has not shifted markedly since 2001 (Burrowes, 2007), this indicates that the profession is experiencing an attrition of women engineers.

Marinelli and Calais (2011) revealed gender differences in engineering labour force participation by age. Male engineers were observed to exit the engineering labour force at retirement age, while women displayed lower levels of participation in the engineering workforce from early career, peaking during childbearing years. Women with engineering qualifications enter the engineering labour force post qualification at lower levels than male counterparts. Those not in the engineering workforce were in full-time or part-time study, or were not employed due to family responsibilities.

2.5.2.2 Women Engineers are International

The majority of women engineers in Australia were born outside of Australia. As noted in Section 2.3.4, skilled migration has been the primary source of engineers to meet industry demands since 2000. In addition, there has been a substantial increase in the number of overseas students obtaining engineering qualifications in Australia. International student numbers increased by 90% from 2001 to 2008 (Kaspura, 2010). Female international students accounted for almost 90% of the increase in the enrolment of women in engineering courses during this period.

These statistics highlight the international and heterogeneous nature of the qualified engineers in Australia. Women working within the engineering team are likely to work with colleagues with diverse backgrounds, and women managers are likely to manage team members with backgrounds different from their own. Further, international women engineers are likely to experience the highest rates of unemployment and lowest rates of retention, when compared to Australian born women engineers, and all male engineers (Kaspura, 2014).

2.5.2.3 Employment Patterns of Women Engineers

The employment patterns of women engineers in Australia provide a context for the work experiences of women in engineering. Statistics indicate that the small numbers of women engineers are further segregated by industry sector and role type.

When examining the employing sectors of engineering labour force in Australia, gender differences are not seen. Over 80% of both male and female engineers are employed in the private sector; the remaining proportion work for federal, state and local government organisations. However, male and female engineers are clustered in different industry sectors. Women engineers are employed in highest proportions in i) Health Care & Social, ii) Accommodation & Food, and iii) Retail Trade industries, and in lowest proportions in i) Construction, ii) Transport & Postal and iii) Mining sectors (Marinelli & Calais, 2011). In terms of types of roles, women engineers are least likely to be employed as machinery operators, technicians or tradespeople or in management (Kaspura, 2014; Marinelli & Calais, 2011). The clustering of women engineers in lower paid and lower status position was also observed in research surveying Australian women engineers (Mills, Mehrtens, Smith, & Adams, 2008; Roberts & Ayre, 2002).

The low level of women's employment in the resources and construction sectors has been a point of concern for the Australia government and industry groups (Australian Government Office for Women and the Minerals Council of Australia, 2007; Minerals Council of Australia, 2013, 2014; The Chamber of Minerals and Energy of Western Australia, 2008, 2015). Women's engagement in these sectors is impacted by low levels of part-time work, a culture of long hours, and the remote nature of work in the industry sector. Government and industry groups recognize the imperative of increasing the participation of women in these sectors.

The majority of women working in engineering are employed in a full-time capacity, indicating that "traditional industry structures of professional employment dominate" (APESMA, 2007, p. 2). However, part-time work is available and Kaspura (2012) suggests that "significant opportunities for part-time work" exist (p. 15). Women engineers are twice as likely as their male counterparts to work part-time. When women engineers work part-time, they commonly work three days or less per week, while men working part-time are more likely to work more than three days per week (Kaspura, 2012).

2.5.3 Key Concerns, Focus for Research and Initiatives

In Australia, the concerns of women engineers have been captured primarily through voluntary membership-based surveys commissioned by professional bodies such as Engineers Australia and Professionals Australia (formerly APESMA).

The “Career Review of Engineering Women” studies surveyed both male and female members of Engineers Australia (Mills et al., 2008; Roberts & Ayre, 2002). Professionals Australia has regularly surveyed its female members to produce a series of “Women in the STEM Professions” reports. These reports examine the factors contributing to women’s underrepresentation in Science, Technology, Engineering and Mathematics (STEM) professions (APESMA, 2007, 2010; Professionals Australia, 2014; Rickard & Crowther, 2015). Key areas of concern identified by survey participants are summarised in Table 2.2.

Table 2.2 - Areas of Concern for Women Engineers

Area of concern	Particular issues
Workplace culture	Prevalence of discrimination, harassment and bullying
	Negative perception of women engineers’ abilities
	Lack of opportunities for promotion
	Negative attitudes about workplace flexibility, career breaks
	Negative perception of women engineers’ work commitment given that commitment is equated with long hours, presentee-ism, aggression and competitiveness
Remuneration and reward	Pay inequity
	Superannuation inequity due to career breaks

Engineering workplace culture has a strong influence on women’s career advancement, and may act to exclude, marginalise or disadvantage women (Rickard & Crowther, 2015). The culture of engineering workplaces can be characterised as masculine, “based on male defined priorities, values and life choices” and unfriendly to females and families (Roberts & Ayre, 2002, p. 2).

Disturbing levels of discrimination, harassment and bullying were uncovered by both Engineers Australia and Professional Australia surveys. In the initial CREW study, 50% of women reported experiencing discrimination, harassment and paternalistic behaviours (Roberts & Ayre, 2002). Levels of these behaviours had not abated with the revised survey in 2007, and gender based discrimination remained the dominant form of discrimination experienced by respondents (Mills et al., 2008).

Women engineers reported the negative perception by others of their engineering abilities and their suitability as engineers (Lord, Marinelli, & Finlay, 2010; Mills et al., 2008). Women engineers report feeling the need to prove their abilities in the workplace, whereas men are assumed capable (Rickard & Crowther, 2015).

Most women experiencing negative workplace behaviour do not seek help. In the Australian mining sector, a need for safe reporting of harassment and bullying and an understanding of why complaints weren't formalised has been recognised (Minerals Council of Australia, 2007). Experiences of women engineers captured in a sexual harassment workshop in 2009 provided some insight into the high personal and professional cost of using formal procedures in seeking resolution for a complaint (Lord et al., 2010).

A further area of concern was a lack of opportunities for career advancement and promotion. The lack of access to senior roles for women was identified as a major barrier to career advancement for women engineers. Lack of career advancement prompts women to leave a position in engineering, or plan to exit the profession altogether (Mills et al., 2008; Rickard & Crowther, 2015). This was amplified for women who utilised parental leave or flexible work practices to manage work and caring responsibilities.

Balancing work and life commitments is cited as primary barriers to career advancement. Workplace flexibility in the form of part-time work or flexible hours and parental leave is available in many engineering organisations, and is increasing in prevalence (Mills et al., 2008). However, systemic negativity

towards workplace flexibility and disparity between workplace policy and utilisation exist (Rickard & Crowther, 2015). The incompatibility of engineering work with family responsibilities has an impact on women's participation. Just over half of women engineers have children, and their participation in the engineering labour force and rate of full-time work decreases with number of children (Kaspura, 2012).

Career breaks and part-time work are perceived to disadvantage career advancement. In one survey, 25% of women reported having been sidelined for promotion because they had utilised flexible work arrangements, and 50% felt that part-time work had unnecessarily precluded them from certain types of work (Rickard & Crowther, 2015). In a profession where commitment is associated with long hours of work to the detriment of personal time, those utilising flexible work arrangements are judged as not being committed to their work (Roberts & Ayre, 2002). Of interest, the findings of the revised CREW survey contest the reality of the long hours culture of engineering. The study found that "work hours reported by all respondent were in line with those of the average Australian worker and the percentage of people working very long hours was less than that typical of professional employees across Australia" (Mills et al., 2008, p. 27).

A final issue highlighted by the surveys of women engineers is pay inequity. 40% of respondents surveyed by Professionals Australia did not believe that they received equal compensation for equal work (Rickard & Crowther, 2015). This perception is supported by annual remuneration surveys that reveal the average income for engineers is generally higher for male engineers than female engineers beyond entry and junior level positions (Professionals Australia, 2015).

Rickard and Crowther (2015) summarise many of the concerns of women engineers as "core workplace, cultural and industrial issues" (p. 37). Change at both the organisational level and the individual level need to be addressed to improve the retention and advancement of women in engineering (Roberts and Ayre, 2002). The complexity and persistence of these issues has stimulated

academic research into the experiences of women engineers. This body of literature is discussed in Section 3.2. Recent initiatives and interventions for women in engineering are reviewed in Section 2.6.

2.6 Initiatives and Interventions for Women in Engineering

This section describes the initiatives relating to women in engineering in Australia. The following overview highlights the broad but seemingly uncoordinated efforts of several groups at government, industry, profession and organisational levels.

2.6.1 Australian Federal Government Initiatives

The Australian Federal Government has commissioned research, participated in dialogue and provided funding to investigate women's underrepresentation in science and engineering. Burrowes (2007) notes the efforts by the Australian Federal Government to address this disparity and its potential impact on Australia's economy, through the commissioning of a series of reports⁶ through the 1980's and 1990's and the establishment of the Women in Science, Engineering and Technology Advisory Group (WiSET). These early reports called for a comprehensive and systematic approach to increase the participation of women in engineering.

Government interest has re-emerged in recent years in parallel with a focus on innovation and the importance of science and technology to Australia's future and the skills shortage (Office of the Chief Scientist, 2014). In 2009, a report commissioned by the Federation of Australian Scientific and Technological Societies (FASTS) into women's participation in science noted that in the 15 years

⁶ (i) Byrne, E. (1985). *Women in Engineering: A Comparative Overview of New initiatives*. Canberra, Australia: Australian Government Publishing Service, (ii) Department of Employment Education and Training. (1988). *Review of the Discipline of Engineering*. Canberra, Australia: Australian Government Publishing Service and (iii) Women in Science Engineering and Technology Advisory Group (WiSET). (1995). *Women in Science, Engineering and Technology: A Discussion Paper*. Canberra, Australia: Australian Government Publishing Service.

since the release of the WiSET (1995) report, changes were minimal and many of the issues highlighted remain to be addressed.

“... the answer to the question ‘How far have we come?’ must be ‘not nearly far enough’ (Bell, 2009)

The report called for a renewed focus on women in science, engineering and technology, and presented a series of recommendations to increase women’s participation in these workforces. The recommendations focused on the role that government and other organisations within the scientific and engineering community must play in creating positive organisational cultures, ensuring visibility of career paths and supporting of flexible career paths. The importance of monitoring and systematic reporting of gender data and establishing and promoting of best practice was also identified (Bell, 2009).

There have been several notable developments in the past 2 years. There has been increased funding by the current Federal Government led by Prime Minister Malcolm Turnbull, under the guise of innovation. An AUD \$1 billion innovation package announced in 2015, included AUD \$13 million to encourage women to choose and remain in STEM fields, start-ups and entrepreneurial businesses. The funding is pointed at the following initiatives, to be implemented commencing 2016/17:

- Expansion of the Science in Australia Gender Equity (SAGE) program which assesses the work of higher education and research institutions in promoting gender equality.
- Expansion of the ‘Male Champions of Change’ project to focus on STEM-based and entrepreneurial industries.
- Partnering with the private sector on initiatives to celebrate female STEM role models and foster interest in STEM among girls and women (Australian Government, 2016).

2.6.2 Engineers Australia Women in Engineering

A range of groups and networks with an interest in women in engineering has formed in the past two decades. The most prominent of these is the Engineers Australia Women in Engineering group, which has over 12,000 members nationally (Engineers Australia, 2015a).

The Engineers Australia Women in Engineering function was established in the early 1990's, with the vision "that engineering becomes an inclusive profession which values, supports and celebrates the contributions of women in the engineering team" (Engineers Australia, 2016c). Female members of Engineers Australia are automatically granted access to the Women in Engineering group.

At a state level, voluntary committees are tasked with engaging their members through a range of networking and educational activities, promoting the engineering profession to women and girls within the general public, and representing the interests of the female members in other operating committees of Engineers Australia. This includes at the executive level, furnishing representatives to state Executive Committees and Advisory Boards. Activities organised by Women in Engineering are typically focused on the group's objectives of: "Attract, Retain, Support and Celebrate" (Women in Engineering National Committee, 2012).

At the national level, the focus is on policy, strategy and direction (Burrowes, 2007). Efforts have resulted in some key contributions to the women in engineering discourse. These include the publication of the Career Review of Engineering Women (CREW) reports, the inclusion of statistics relating to women's participation in engineering in Engineers Australia annual statistical updates, and the declaration by Engineers Australia of 2007 as the Year of Women in Engineering.

2.6.2.1 2007 - *The Year of Women in Engineering*

The purpose of Engineers Australia Year of Women in Engineering was to increase the visibility of the contribution of women to the engineering profession,

within the profession, industry and wider community, and to promote engineering as a career of choice for women (Women in Engineering National Committee, 2008).

Numerous activities were held to showcase “the achievements of women in the profession, as well as educate the profession and others about issues of concern to women engineering that may be limiting their career progression and preventing other women from entering the profession” (ibid, p. iv). The year was described as “a foundation year for programs for the future that attract and retain women in engineering” (ibid p. 2).

2.6.2.2 Careers Review of Engineering Women Reports

In 1999, the Careers Review of Engineering Women (CREW) project examined women’s retention, satisfaction and progression in the engineering workforce. This was the first study of issues relating to retention and disadvantage for women engineers in Australia. As noted in section 2.5.3, the study revealed that the culture of many engineering workplaces posed difficulty for women. Further, the study highlighted a trend of women aged over 30 leaving the profession. The study offered nine recommendations targeted at cultural change within engineering organisations and behavioural change at the level of engineering managers and engineers.

The study was repeated in 2007, revealing a slight improvement in workplace satisfaction, but a persistence of discrimination and bullying behaviours. The updated study reiterated the recommendations of the previous study, noting that many organisations had not made progress in their implementation. The findings of the CREW reports generally supported the findings of earlier studies by the Australian Government.

2.6.2.3 Engineering Profession Statistics

Engineers Australia produces annual statistical updates on the engineering profession, as input to policy development and planning (Kaspura, 2010). Gender distribution of engineering students, qualified members of the engineering

professions and aspects of engineering working life have been routinely included since 2007.

A thorough analysis of statistics pertaining to women's participation in the engineering labour force, and the precursors of engineering enabling subject uptake at secondary school level and commencement and completion of engineering studies at tertiary level, was produced in 2012 (Kaspura, 2012). The combination of this detailed data and findings of the CREW studies reinforce the lack of progress in understanding and addressing persistently low levels of women in the engineering profession in Australia. Of note, this detailed analysis was based on data from the Australian census conducted in 2006 and has not yet been updated to reflect more recent Australian censuses from 2011 or 2016.

2.6.3 Other Professional and Industry Bodies

Alternative networks exist for both individual and corporate members. Some are industry focused and are not primarily targeted to women engineers, but are very popular and have high visibility in industry and the public arena. A sample of the key bodies and networks with active initiatives in relation to women in engineering are listed below in Table 2.3.

Table 2.3 – Professional Organisations and Networks in Australia Relating to Women in Engineering (as at June 2016)

		Membership Basis	
		Profession	Industry
Focus	Individual	Engineers Australia Women in Engineering	Women in Mining Network (WIMNet)
		Professionals Australia (formerly APESMA)	Women in Mining & Resources (various states)
		Women in Science Australia	National Association of Women in Construction
		IEEE Women in Engineering (International)	Women in Oil and Gas (WA)
			Females in IT and Telecommunications (FiTT)

		University based women in engineering groups	Women in Technology (WiT) (QLD / WA) Corporate women's networks
	Companies		Minerals Council of Australia (MCA) Australia Women in Resources Alliance (AWRA) (via AMMA) The Chamber of Minerals and Energy of Western Australia (CME) Women in Resources

The listed networks and groups offer similar initiatives. It is beyond the scope of this thesis to review all available initiatives in detail, however a listed summary of the types of initiatives is provided below. Of greater relevance is how these initiatives relate to women's advancement to senior roles in STEM and this is reviewed in section 2.6.4.

Major activities for individuals and organisations are summarised in Table 2.4.

Table 2.4 - Increasing Women's Participation in Engineering: Initiatives for Individuals and Organisations

For Individuals	
Networking	Opportunities to form relationships with other women working in the profession or industry, opportunities to learn 'how to network'.
Role Models	Profiling of successful engineering women through presentations and interviews, recognition and awards for highly successful women.
Professional Development	Opportunities to develop technical and business skills; provision scholarships for courses relating to management and leadership, company directorships.

Mentoring	Programs that connect female mentees with experienced male and female professionals in engineering or employing industries.
For Organisations	
Information	Provision of research-based information through reports, webinars and forums providing statistics, best practice and general information for organisations on workplace diversity.
Resources	Practical assistance with developing in-house gender diversity strategies and initiatives, including coaching and consulting services and written guides and tool-kits.
Recognition	Awards and publicity for organisations with initiatives enhancing the participation of women in engineering or employing industries.

2.6.4 Initiatives Relating to Women in Management and Leadership in STEM

There are very few initiatives within Australia aimed specifically at women in management and leadership, or the transition to these roles, within industry based engineering and science related careers. This contrasts with the USA and UK where dedicated career development resources for women manager and leaders in engineering are available (for example: IEEE Women in Engineering International Leadership conference in the USA, and the WISE Career development programme for Women in STEM in the UK).

However, the aims of many individual and company focused initiatives listed in sections 2.6.1 to 2.6.3 are targeted at retaining women in engineering, and in doing so influence their advancement prospects. Paradoxically, many of these initiatives remain focused on building women's capabilities and confidence, rather than addressing the cultural issues identified by research as being at the core of women's low participation in engineering, and in senior roles within the profession.

A positive development during the period of this research project is the increased engagement of professional groups with organisations and the production of

resources aimed at creating awareness and change around their organisation's gender culture. This is likely linked to the rise of measurement and reporting of organisational gender diversity required by the current Workplace Gender Equality Act 2012 and modifications to the ASX Corporate Governance Principles and Recommendations in 2010 (refer to Section 2.2.1 for further details of these requirements).

2.6.4.1 Opportunities for Professional Development

Professional development opportunities specifically for women managers and leaders in engineering are rare. Engineering Education Australia offer a professional development program targeted at women entitled 'Leadership Skills for Professional Women'. The program focuses on the "development of confidence and leadership qualities that are viewed as essential for high performance" (Engineering Education Australia, 2016) and is delivered annually in a selection of Australian capital cities.

For women at executive level, several scholarship opportunities have become available over the past five years. With a view to promoting gender diversity on mining company boards, the Minerals Council of Australia (MCA) began offering scholarships for women in 2012. Each scholarship includes registration for the Australian Institute of Company Directors (AICD) Company Director's Course, and a one year membership of the AICD (Minerals Council of Australia, 2012). THE AICD Company Directors course is a well-recognised qualification for board directors with in excess of 15,000 graduates worldwide (Marinelli, Lord, & Jefferson, 2012c). As of 2016, total of 15 scholarships have been awarded to women working in senior roles in mining organisations in Australia.

2.6.4.2 Mentoring

Mentoring programs have proliferated in recent years and are offered by profession specific and industry groups. These programs are typically small in scale, administered locally and targeted at women at all career levels. An interesting alternative is the e-mentoring program offered by the Australian Women in Resources Alliance (AWRA), designed to make mentoring available to

women in resources and associated industries who may work in remote locations or have atypical work schedules (Australian Mining and Metals Association, 2014). Currently, there are no mentoring programs specifically aimed at women in senior roles in the engineering profession.

2.6.4.3 Creating Cultural Awareness and Change

Researchers have called for cultural and behavioural change within the engineering profession and employing organisations to remedy the persistent lack of women in engineering. It is the underlying factor in women's experiences and current measures do not change this status quo (Sharp, Franzway, Mills, & Gill, 2012). In recent years, industry and profession- focused groups have developed resources to assist organisations with this. Areas of focus include developing diversity strategies within organisations, including corporate women's programs, methods for developing and implementing flexible workplace practices (Australia Women in Resources Alliance, 2015; Kanga, 2014), and increasing awareness and mitigation of unconscious gender bias (Engineers Australia, 2015b).

2.7 Chapter Summary

The advancement of women engineers to management and leadership within technical organisations is experienced within a context of evolving employment for women generally, increased entry to engineering and other professional historically undertaken by men, and greater opportunity for participation in organisational management and leadership. This has been stimulated and supported by legislation, monitoring and reporting of workplace diversity, and establishment of diversity initiatives.

The engineering profession in Australia is widespread and diverse, with engineers of varied specialisation working in a broad range of industries and organisation roles. A notable proportion of qualified engineers work outside of the 'engineering profession' indicating desirability and transferability of engineers' skills, and pointing to retention issues within the profession. For

engineers within the 'engineering profession', the majority will become managers within their careers. Engineering careers may be more varied in practice, offering alternative pathways or paths that are not clearly distinguished, with management being an important aspect of rather than separate to engineering work.

Resource and infrastructure sector prosperity has contributed to the changes within the profession though increasing 'projectification' of engineering work, the shortage of skilled engineers which has led to purposeful skilled migration by government and organisations. The international diversity of the profession has been furthered by the attractiveness of Australian engineering studies for international students.

For women engineers, participation increased during the 1980's and 1990's but has remained static for several decades. Women's engineering employment is characterised by high attrition rates and retention issues related to the highly masculine professional and workplace cultures. Inequity in remuneration and promotion further exacerbate negative workplace experiences for women engineers. Initiatives focusing on increasing the proportion of women engineers have largely been ineffective to date, and there has been little focus on women in management and leadership, or the transition to these roles, within industry based engineering and science related careers.

The next chapter examines the literature relating to women's experience of transition from engineer to manager and leader in order to define the significance and scope of this research project.

3 A Review of the Literature

3.1 Introduction

The previous chapter established the context for this research project on women engineer's advancement into management and leadership within Australian organisations. It described aspects of working life that are relevant to women in the Australian engineering profession.

This chapter critically reviews the academic literature relevant to this study. The aim is to synthesise and evaluate research relating to women engineers' advancement to management and leadership roles in Australia in order to define the significance and scope of this research project.

The progression of women engineer's careers and their advancement to managers and leaders is located at the intersection of three research areas which explore issues relevant to gender, the engineering profession and advancement to management and leadership. The literature review reveals that most research combines two of these three areas, providing insights into:

- women in the engineering profession,
- women's progression to manager and leader in a range occupations and industries, and
- management and leadership in the engineering profession.

As will be demonstrated, there is little research that provides a detailed account of the point at which all three areas intersect and that gives a gendered account of women's capacity to successfully progress to leadership and management roles within engineering professions.

The literature review was conducted around the three key areas of intersection noted above and shown in Figure 3.1. Thus, section 3.3 focuses on women's minority status in the engineering profession. Section 3.4 focuses on the multi-level influences on women's progression and to management and leadership roles and section 3.5 focuses on research providing insights into management

and leadership roles in the engineering profession. At the end of each section, key points revealed by the review are summarised and the potential contributions of this research project are described.

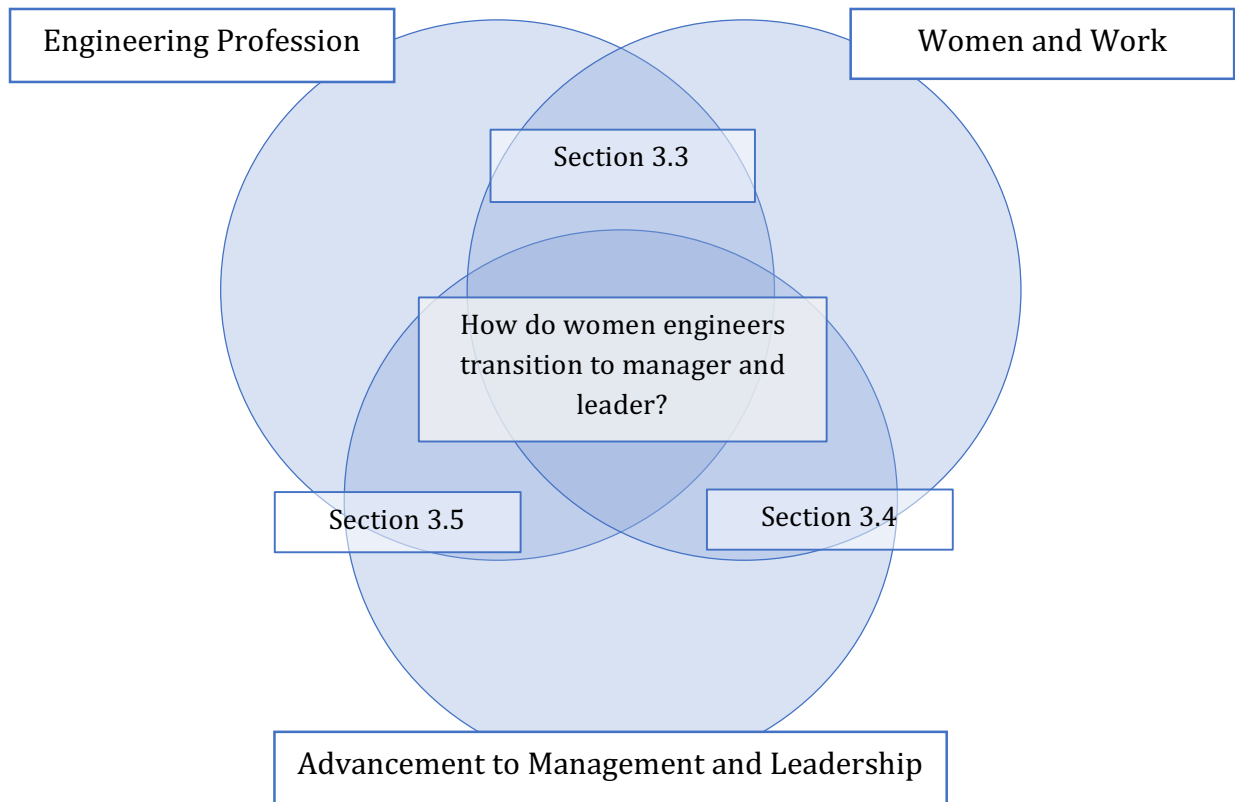


Figure 3.1 - Areas of Intersection Guiding the Literature Review

The review concludes with a summary of the fragmented nature of research relating to women engineers' advancement to management and leadership roles in Australia. It is argued that this arises because little research combines all three key factors: gender, engineering and management and leadership.

3.2 Approach to the Literature Review

"Qualitative texts refer to the need to review the literature so that one can provide the rationale for the problem and position one's study within the ongoing literature about the topic" (Creswell, 2007, p. 102)

The literature review conducted at the commencement of a study lays the foundation for the research (Oliver, 2008). It assists the researcher to navigate the existing body of knowledge surrounding the topic of interest and to identify possible gaps in the existing literature so as to formulate the research question and establish the enquiry framework. Gall, Borg, and Gall (1996) provide several reasons for conducting a literature review at the start of a research study:

- Delimiting the research problem.
- Seeking new lines of enquiry.
- Gaining methodological insights.

The framework adopted for conducting the initial literature review for this research project draws on Machi and McEvoy (2009) who advocate:

- searching the literature;
- developing an organising, synthesising and analysing the data into a body of evidence of what is known about the topic;
- critiquing and interpreting the current understanding of the topic in relation to the research problem; and
- writing the review.

Defining the parameters of the literature review involves formulating questions to guide the literature review, based on the purpose of the review, and determining the criteria for the scope and extent of the review, that is: the criteria for inclusion and exclusion (Randolf, 2009).

In this study, the purpose of the literature review was to transform the researcher's personal experience and experiential observations into a defined research problem, grounded in the extant literature. The aim of the review was to establish the current picture of research relating to women engineers' advancement to management and leadership roles in Australia, to define the research problem central to this thesis and to locate it within the existing literature. To achieve this, three key areas of literature were explored. These

areas are mapped in Figure 3.2 which also highlights a selection of publications and illustrates the gaps in the literature that will be addressed by this research.

This literature review covers scholarly journals, prominent industry journals, published books and academic conference papers. Published industry reports were considered in establishing the context of the research, but were not included in a critical review of the research literature. Existing literature from Australia, the USA, Canada and Europe published within the past 15 years was explored in detail but the time line was extended to include key publications identified from this literature, particularly key contributions to theory, or areas of literature with a lack of current research.


Women in the Engineering Profession	Women's Advancement to Management and Leadership Roles	Becoming a Manager and Leader in the Engineering Profession
<p><u>Women's Minority Status: Causes & Consequences</u></p> <ul style="list-style-type: none"> • McIlwee & Robinson (1992) • Evetts (1993, 1998) • Fletcher (1999) • Miller (2004) • Watts (2009) • Faulkner (2009 a / b) • Powell, Bagilhole & Dainty (2009) • A series of papers by Mills, Gill, Sharp, Franzway & Bastalich <p><u>Persistence</u></p> <ul style="list-style-type: none"> • Fouad & Singh (2011), Singh et al (2013) • Buse, Bilimoria & Perelli (2013), Buse & Bilimoria (2014) • Ayre, Mills & Gill (2011/b, 2013, 2014) <p><u>Belonging and Identity</u></p> <ul style="list-style-type: none"> • Jorgerson (2002) • Faulkner (2007, 2009 a/b) • Hatmaker (2012, 2013) <p><u>Women Engineers' Career Advancement</u></p> <ul style="list-style-type: none"> • Evetts (1993, 1997, 1998) • Servon & Visser (2011) 	<p><u>Multi-level Influences</u></p> <ul style="list-style-type: none"> • Ragins & Sundstrom (1989) • Tharenou (1997,1999) • Empirical studies by Tharenou and Metz <p><u>Role sex-typing, gender stereotypes & bias:</u> Shein (1973, 1975, 2001), Heilman (2001), Eagly & Johannesen-Schmidt (2001), Agars (2004)</p> <p><u>Organisational factors:</u> Nesbit & Seeger (2007)</p> <p><u>Social capital (sample only):</u> Ibarra (1993), Ragins (1999), Ibarra, Carter & Silva (2010), Singh et al (2009), Kumra & Vinnicombe (2010)</p> <p><u>Individual factors:</u> Marongiu & Ekehammar (1999, 2001), Powell & Butterfield (1981, 2003, 2013)</p> <p><u>Women's experiences</u></p> <ul style="list-style-type: none"> • Priola & Brannan (2009) • Coleman (2011) • Lord (2007) <p><u>Women's managerial and leadership identity</u></p> <ul style="list-style-type: none"> • Ely et al (2011) • Ibarra & Petriglieri (2016) • Sealy & Singh (2010) 	<p><u>The Engineer-Manager Transition</u></p> <ul style="list-style-type: none"> • Badawy (1981, 1995) • Morrison (1986) • Roberts & Biddle (1994) <p><u>Challenges and motives</u></p> <ul style="list-style-type: none"> • Bailyn & Lynch (1983) • Howard (2003) • Wilde (2009) <p><u>Motives</u></p> <ul style="list-style-type: none"> • Johnson & Sargeant (1998) • Rynes (1987) <p><u>The Transition Process</u></p> <ul style="list-style-type: none"> • Seethamraju (1997) <p><u>Engineering Leadership</u> <u>Leadership Development:</u> Farr, & Brazil (2009), Breaux (2006)</p> <p><u>Conceptualising Engineering Leadership:</u> Rottman, Sacks & Reeve (2015)</p> <p><u>Gender & Engineering Leadership:</u> Rottman, Sacks, Simpson & Reeve (2015); Reeve, Rottman & Sacks (2015)</p>
<p style="text-align: center;">  </p>		

Figure 3.2 - Literature Review Map

3.3 Women's Minority Status in the Engineering Profession: Causes and Consequences

Researchers interested in the minority status of women in the engineering profession have produced a substantive body of work exploring the attraction, retention and persistence of women in engineering studies, into engineering academia and education and into professional engineering practice.

In the previous chapter, an overview of women's participation within the engineering profession in Australia contributed to the context for this study. This section focuses on academic research centred on women engineers working in industry, as indicated by Figure 3.3. The purpose of this review is to reveal what we know about the factors contributing to women's minority status in the engineering profession and what remains to be discovered.

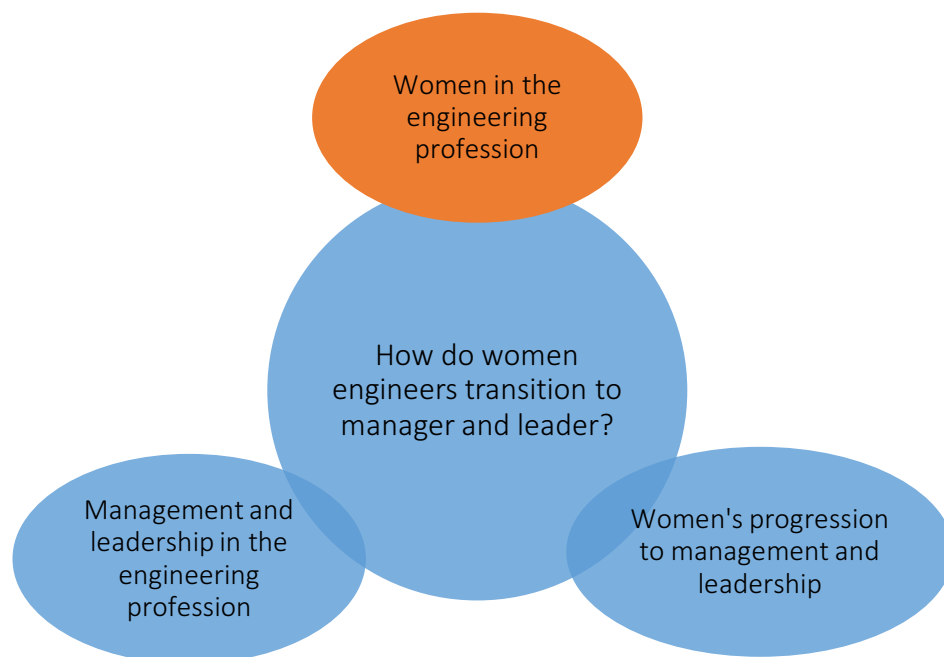


Figure 3.3 - Literature Review Focus: Women in the Engineering Profession

There are several themes emphasised in the existing 'women in engineering' research. These themes are used to structure the review of literature pertaining to women engineers working in industry in Australia. Firstly, underlying many of the challenges encountered by women engineers is the entrenched, highly

masculine culture of the engineering workplace. This study is not concerned specifically with the question of women leaving the profession, but an understanding of the complexities encountered by women in the profession and the barriers to their retention and progress is relevant as it illustrates the professional environment of the study participants. Secondly, the strategies employed by women engineers as they negotiate these challenges are reviewed. The persistence and career success of women engineers is an emerging focus in the women in engineering research. This literature, and the associated research on women engineers' belonging and identity are considered. Finally, the small number of empirical studies relating to women's progress to management and leadership positions in engineering is discussed. The potential contribution of the current study on women engineers' transition to managers and leaders to the extant women in engineering literature is outlined.

3.3.1 Causes: The Influence of Workplace Culture

The observation of gendered differences in the retention rate of professional engineers has prompted an exploration of women's experiences in and attrition from engineering workplaces, in the Australian and broader international contexts. Hewlett (2008) examined the 'brain drain' of women from science, engineering and technology (SET) professions, while Fouad and Singh (2011) explored the reasons for women's actual and intended departure from the engineering profession. In the Australian setting, a series of studies have investigated the persistent nature of male-dominance of engineering (Bastalich, Franzway, Gill, Mills, & Sharp, 2007; Gill, Mills, Franway, & Sharp, 2005; Gill, Sharp, Mills, & Franway, 2008; Mills, Bastalich, Franzway, Gill, & Sharp, 2006; Roberts & Ayre, 2002). Researchers concur that engineering workplace culture is a source of the persistent problem of the lack of women in engineering (Mills et al., 2006) and that many of the challenges encountered by women in the engineering profession can be linked to working in a largely male environment (McIlwee & Robinson, 1992).

Organisational or occupational cultures are associated with shared meanings, ideas, symbols and beliefs with a particular workplace or occupation (Alvesson &

Due Billing, 2009). These shared concepts influence the behaviour and practices of group members and define what is acceptable or normal for that group. According to Faulkner (2009a) workplace culture is important as it “oils the wheels of the job and the organisation” and controls “who is included and excluded at work” (p. 5).

For a predominantly male profession, such as engineering, or organisations that employ large number of engineers and associated professionals, the associated culture is influenced by the dominant group (Kanter, 1977). However, workplace cultures of engineering organisations do differ. According to McIlwee and Robinson (1992), workplace culture is not only dependent on the numerical dominance of a group but also the power of a group within the organisation. Sharp et al. (2012) draw on earlier work on the concept of ‘sexual politics’ and apply it to engineering to explain the gendered power structure of relationships within engineering organisations.

In organisations where men are dominant and powerful, workplace culture is associated with the male gender role (McIlwee & Robinson, 1992). The historic yet enduring image of engineering is associated with heavy, dirty work that is unsuitable for women (Evetts, 1998). Acceptable styles of interaction and behaviour within engineering organisations stem from masculine values and norms, which may include aggression, competitiveness and a technical orientation. The definitions of professional competence, and the criteria for success, achievement of power and advancement are also defined in masculine terms. McIlwee and Robinson (1992) note that in engineering organisations the “terms of competition” (p. 125) and “what kind of person makes it” (p. 119) are aligned with the masculine workplace culture.

Research indicates that engineering culture and its forms of masculinity are difficult for women (Franzway, Sharp, Mills, & Gill, 2009). Many issues stem from women’s apparent non-conformity with the prevailing culture. International studies have found that engineering workplaces exude a hostile and macho culture that marginalises women (Hewlett, 2008) and are structured by exclusive interactions described as “condescending paternalism” (Miller, 2004, p. 50),

values, beliefs and symbols that reinforce gender divisions. Similarly, in Australia, Bastalich et al. (2007) found that the engineering workplace culture was defined by “a narrow set of masculine norms and is intolerant of diversity. Within the engineering workplace culture, ‘women’ or anyone who fails to confirm to strict codes of masculine conduct is cast as an outsider or foreign” (p. 397).

In contrast to the narrow masculine norms described by Bastalich et al. (2007), an ethnographic study by Faulkner (2009a) reported workplace cultures that accommodated a range of masculinities enacted by a variety of men. Further, in contrast to the hostility, condescension and marginalisation noted by Miller (2004) and Hewlett (2008), Faulkner observed more subtle dynamics and practices combining both gender inclusive and exclusive interactions that made it more difficult for women and others on the edges of the culture to belong.

3.3.2 Consequences: Strategies for Dealing with the Engineering Workplace

“Women can and do pursue rewarding careers in engineering, often balancing these with families and leisure pursuits, but their paucity is an indication of the sometimes extreme difficulty of doing so” (Watts, 2009, p. 53)

An overview of the challenges encountered by women in the engineering profession has been provided in Section 2.5.3. Research has identified a range of strategies employed by women engineers to negotiate these challenges. Many of these are directed at achieving acceptance by the dominant, male group. The “challenge of gaining acceptance and respect from male peers” (p. 53) is a regular occurrence for women engineers (Watts, 2009).

Strategies include adapting to the dominant masculine culture, or emphasising differences between women engineers and prevailing norms. Coping strategies typically involve managing individual behaviour or “evolving a persona” (Gill et al., 2005) or focus on altering work schedules or career decisions. Most approaches circumnavigate the issues, but serve to reinforce the existing masculine system rather than to change it (Gill et al., 2005; Miller, 2004).

3.3.2.1 Alignment with the Prevailing Culture

Underlying this approach is conformity to masculine norms, accompanied by the emphasis on masculine behaviours and minimisation of qualities associated with the feminine. Being successful as an engineer means being perceived to be as competent as men and being different to other women. Further, this approach is associated with rejecting the influence of gender on workplace experiences, particularly in relation to challenges and difficulties (Bastalich et al., 2007).

This approach affects physical appearance and dress, social interaction style and work habits. McIlwee and Robinson (1992) state “to be taken as an engineer is to look like an engineer, talk like an engineer and act like an engineer. In most workplaces, this means looking, talking and acting male” (p. 21). In the Australian context, researchers observed women engineers becoming ‘one of the blokes’⁷, typified by dressing in a masculine way, describing personal characteristics in a masculine way, disappearing femininity, and being comfortable with being treated like a man by colleagues (Bastalich et al., 2007; Gill et al., 2005; Mills et al., 2006). These findings are supported by studies specific to the oil and construction industries, where women choose to take an aggressive and confident approach to their work and dealings with others in the workplace (Miller, 2004), or engage in masculine, pub-based socialising (Watts, 2009).

Some women engineers actively suppress more feminine behaviours such as showing emotion and displaying empathy, or masking sexuality by dressing carefully, taking care not to highlight their being female (Miller, 2004). They express a desire to be seen as an ‘engineer’ rather than a ‘woman engineer’ (Gill et al., 2005; Miller, 2004; Powell, Bagilhole, & Dainty, 2009). If sexism or gender based challenges are encountered, women seek and find it important not to react to them (Bastalich et al., 2007). This is conceptualised by Powell et al. (2009) as the ‘undoing’ of gender - that is: in adopting adaptive coping techniques, and in order to gain acceptance in a highly masculine culture women “deny aspects of

⁷ Bloke [noun]: a man, often one who is considered to be ordinary (Cambridge University Press, 2016).

themselves and become more like men” (Powell et al., 2009, p. 424). This is perceived as an approach that results in being taken seriously and as a prerequisite for success.

Research highlights the tension that exists between overtly masculine behaviour and behaviour that is expected and accepted for women (Powell et al., 2009). Faulkner (2009b) states that “women engineering are expected to ‘blend in’ but, at the same time, not to behave like men in certain areas” (p. 169). A careful balancing of the cultural expectations of being a woman and or being an engineer is required (Evetts, 1998). Further, Bastalich et al. (2007) view the alignment / adaptation approach as problematic as it “recirculates the dialogue about women as ‘dependent’, ‘emotional’ and ‘irrational’ – qualities that are associated with femininity and devalued with engineering workplace culture” (p. 393).

3.3.2.2 Acknowledgment of Difference

Another strategy is the acknowledgement or emphasis of women’s differences and of feminine qualities. Underlying this approach is the ‘difference’ narrative described by Bastalich et al. (2007) in which men and women are perceived to bring different qualities to the workplace.

Women engineers may adopt a feminine persona as a means for coping with their highlighted difference. Gill et al. (2005) describe the “pretty woman” (p. 19) approach in which women engineers assume archetypal female roles of daughter, wife or mother in the workplace. They may dress in a feminine way or enjoy the uniqueness or special treatment that accompanies being one of few women in the workplace. These roles are particularly relevant for younger women who “establish familial, paternalistic, or ‘grand-daughterly’ relationships with men in the workplace” (Bastalich et al., 2007 p. 395) in order to be acknowledged or listened to. Evetts (1998) observed an approach tagged as “playing the little woman” (p. 287), typified by tolerance and acceptance of gender challenges, and of displaying female behaviours such as crying or getting upset when provoked or confronted.

Adopting this position can be difficult for women to sustain, making them “vulnerable to derogation and a quiet hostility” (Bastalich et al., 2007, p. 395). Highlighting difference can cause difficulties as it emphasises women’s minority position. While adopting certain recognised roles within the workplace may deem difference acceptable, it can adversely impact career advancement and promotion prospects as ‘feminine’ behaviours are perceived as passive, weakness and submissive (Evetts, 1998).

Other ‘difference’ strategies involve taking a career direction that deviates from typical career advancement pathways. Women engineers may avoid, or may be encouraged to avoid the management pathway and take a ‘side-step’ to a lateral pathway or practitioner role, placing priority on interesting and varied work rather than hierarchical organisational roles (Evetts, 1998; Ismail, 2003; Watts, 2009). Moving away from core business can serve to ease the pressure of being “locked into traditional, inflexible working practices” (Watts, 2009, p. 48) of managerial careers, but adversely impacts women’s advancement in SET professions leading to a prevalence of highly skilled technical specialists, rather than managers (Evetts, 1998; Fouad & Singh, 2011).

Other women leave the engineering profession to work elsewhere. Fouad and Singh (2011) found that two thirds of the women who had left the engineering field were working in alternative fields and half of those were working in executive positions. The key reasons for leaving the profession related to work environments, skill underutilisation, compensation, and levels of recognition and advancement opportunities (Fouad, Chang, Wan, & Singh, 2017).

Self-employment is also common. While both men and women engineers choose the ‘entrepreneurial’ path for autonomy and control, women engineers cite flexibility and avoidance of the dominant long work hour culture as reasons for self-employment (Ranson, 2003; Watts, 2009).

3.3.2.3 Alternative Approaches

Evetts (1998) describes an alternative approach that centres on establishing a positive professional reputation. Building a reputation and being thought of as a

good engineer appears to negate the 'contrary' expectations of woman and engineer. A later study by Powell et al. (2009) also found that women engineers used reputation to overcome difficulties and to counteract gender. Bastalich et al. (2007) surmise that women engineers' competence and passion for engineering disrupts established norms and practices. However, this approach also presents difficulties as reputation and competence are grounded in the gendered success paradigm of engineering (Evetts, 1998).

Not all women engineers choose to modify their behaviour, augment their work schedules or compromise on their career choices. A small proportion of women engineers choose to challenge the existing paradigm and become agents of change in the workplace (Mills et al., 2006). These women engineers focus on improving conditions for other women. This strategy requires a foundation of confidence and professional credibility, and is often adopted later in a career following "several years of fitting in" (ibid, p. 146). This approach is like that of 'fronting it out' discussed by Evetts (1998) in which women managed gender in their organisations by confronting issues rather than accepting them.

The ability to withstand aggressive male behaviour is important to professional success (Jorgenson, 2002). Adopting the role of change agent is not easy, requiring a certain personality and having the potential to incur "significant cost in terms of pressure and exhaustion" (Mills et al., 2006, p. 146).

3.3.3 Women's Persistence in Engineering

An emerging body of work from the USA and Australia explores the experiences of women who have chosen to remain in the engineering profession. This is a shift in emphasis from previous research that centred on the challenges encountered by women and strategies that they employ to negotiate the challenges. Individual and contextual differences between women engineers who have chosen to continue working in engineering, and those that have left their engineering careers, have been identified.

Singh et al. (2013) combine social cognitive career theory (SCCT)⁸ and elements of turnover theory⁹ to examine the predictors of women's decisions to remain or leave engineering. Women's intention to stay or leave engineering was related to their job satisfaction and commitment, self-efficacy and outcome expectations relating specifically to engineering tasks. Women engineers with higher levels of confidence in performing engineering tasks and positive expectations of the outcomes resulting from those tasks were more likely to remain in engineering because they experienced higher levels of job satisfaction and stronger commitment to their organisations. Buse, Bilimoria, and Perelli (2013) also found that women who remained in engineering careers were higher in self-efficacy and reported elevated levels of work engagement and fulfilment.

Women engineers who remain are more likely to hold a strong engineering identity, than those that leave the profession (Buse et al., 2013; Plett, Hawkinson, Van Antwerp, Wilson, & Bruxvoort, 2011). Early work on women engineers and identity describes women engineers as strongly career-identified individuals who draw meaning and a sense of distinction and status from their engineering work (Jorgenson, 2002).

Buse and Bilimoria (2014) draw on the concepts of the 'ideal self' and 'real self' from intentional change theory (ICT) to explain women's persistence in engineering. Alignment of the ideal self and the real self, or the existence of a "personal vision of oneself in that profession" (ibid, p. 3) results in career persistence. Women who are able to realise their ideal selves through working as engineers were more likely to be engaged in their work, and have a greater commitment to engineering, reinforcing the role of job engagement in women's

⁸ SCCT describes the influence that the individual factors of self-efficacy and outcome expectations have on an individual's career interests, career related goals and actions. Further, contextual factors may act as facilitators or inhibitors to taking action (Lent, Brown, & Hackett, 1994).

⁹ Turnover theory relates job attitudes such as the degree of satisfaction with work, or a person's level of commitment to an organisation, to the intention to leave that organisation (Tett & Meyer, 1993).

persistence in engineering previously highlighted by Singh et al. (2013). Further, Buse and Bilimoria (2014) found that the 'ideal self' is shaped by four individual factors of hope, identity, self-efficacy and optimism, strengthening the relationship between professional identity, self-efficacy and women engineer's career persistence suggested by previous studies.

In the Australian context, Ayre, Mills, & Gill, (2011a, 2011b, 2013) identified a 95% retention rate in a cohort of female civil engineers who had graduated from a specific technical university in Australia between 1974 and 2008. Several factors may be associated with the women's longevity in engineering including: i) higher levels of job satisfaction, ii) greater availability and utilisation of family friendly conditions at their workplaces, and iii) a high proportion of public sector employment (Ayre et al., 2011b).

Interviews with a selection of alumni revealed with women's satisfaction and enjoyment gained from engineering employment (Ayre et al., 2013). The women revealed a strong belief in themselves as engineers and their abilities in their engineering roles. Further, they expressed a sense of belonging in the profession, supporting findings relating to identity, self-efficacy and outcome expectations identified in persistence studies (Buse et al., 2013; Fouad & Singh, 2011; Plett et al., 2011).

Ayre and colleagues observed that the sense of belonging expressed by women who had remained in engineering had not occurred automatically. Instead, it resulted from the sense of having appropriate skills and competence to do their jobs, gaining satisfaction from their work, and feeling accepted and respected by colleagues. When workplace experiences did not elucidate this sense of belonging, the women found ways to "reposition themselves in relation to the prevailing culture" (Ayre et al., 2013, p. 229) in order to better achieve it. Techniques included reframing engineering to include proficiency in both social and technical skills, repositioning themselves to achieve recognition and respect by making changes in their personal style or visibility, or changing their workplace to one with more supportive conditions. These techniques are subtler

and perhaps more conscious than many of the coping strategies highlighted in section 3.3.2.

Hatmaker (2013) states:

“at the heart of the matter for women in engineering, and for women in other male-dominated and gendered masculine professions, is how to achieve a sense of belonging” (p. 383).

Hatmaker’s work on belonging and identity construction reveals that women engineers undertake different and greater levels of identity work than male engineers to form their professional engineering identity (Hatmaker, 2012). As members of the majority group, male engineers often took job roles for granted (particularly the ‘technical’ aspect of their role) and gave “less thought to their identity construction in general within this context” (ibid p. 19).

The incongruence between cultural expectations of being an engineer and being a woman (Evetts, 1998) or gender in/authenticity (Faulkner, 2009b) is a challenge for women engineers. Faulkner explains that because the majority of engineers are men, engineering is perceived as a more authentic choice for men than women and they easily gain ‘real’ membership of the professional group. For women, the inauthenticity of woman and engineer results in an ‘in/visibility paradox’. Women are invisible as engineers, while being highly visible as women. They are forced to perform “additional identity work on both fronts if they are to secure their membership in the community of practice and so stay and progress in engineering” (p. 181). This identity work is ongoing – women must re-establish themselves as engineers repeatedly as their careers progress (Faulkner, 2007).

Hatmaker (2013) explores the role that interpersonal interactions, such as verbal communications with peers, subordinates and managers, play in shaping engineering professional identity. The author found that the interactions with others in the work context as described by the women in her study “marginalised their professional identity and over validated their gender identity” (ibid p. 386). Interactions marginalise professional identity, through:

1. Amplifying gender: interactions that called attention to being a woman, rather than an engineer.
2. Imposing gendered expectations: requests or assumptions based on gendered stereotypes.
3. Tuning out: interactions in which contributions were ignored.
4. Doubting technical abilities: women's technical capacity is questioned.

Hatmaker's study reveals that women engineers walk a gendered terrain. Tactics to negotiate this terrain served to "divert attention away from being a woman and toward their identity as an engineer" (ibid p. 386) and aimed to achieve a sense of belonging. These included impression management mechanisms such as presenting a professional image, and proving oneself, and coping tactics of blocking and rationalisation. Several of these techniques align with those previously discussed in section 3.3.2.

Women who remain in the engineering profession are more likely to describe their work in collaborative and relational terms. Buse et al. (2013) found that 'persisters' displayed an 'other orientation' in which they framed their work experiences "in terms of reciprocal engagement with others, including collaboration and providing support, counsel and advice" (p. 146). The desire to experience work as a connective and collaborate practice supports Plett et al. (2011), who identified that the level of workplace relatedness and opportunities to serve others within the workplace influence women's persistence in engineering. The mismatch between the desired and actual level of relatedness and opportunity for service may result in intention to leave (Plett et al., 2011).

A further difference between women who continue to pursue engineering careers, and those that do not, is their orientation to the engineering culture and engineering work. Jorgenson (2002) found that these women engineers welcomed the challenges and demands of their organisational cultures rather than perceiving themselves as victims. Buse et al. (2013) made a similar observation. While all women engineers in their study described challenges associated with the male-dominated engineering culture, women who remained

in the profession actively adapted to the culture, while women who had chosen to leave expressed frustration with the prevailing culture.

As described in section 2.5.3, engineering workplace culture, and related difficulties of managing engineering work and family responsibilities, influences women's exit from engineering careers. Ayre, Mills, and Gill (2014) provide insight into how women engineers with children have continued to pursue successful engineering careers. Their study revealed that while career challenges and hazards were encountered, a range of strategies enabled women engineers to remain. These included choosing employment in the Australian public or government sector, due to flexible employment conditions and greater acceptance of using flexible workplace practices. Women who did not yet have children were "quite prepared to move to a more family-friendly employer if necessary" (ibid p. 96), reinforcing women's preparedness to re-position themselves when needed to continue their careers (Buse et al., 2013). This contrasts with studies that highlight the tempered uptake of flexible work arrangements by women engineers. Watts (2009) found that use of flexible work arrangements was often only possible after extended tenure with a company. With the norm of long hours and presentee-ism, reduced face time is detrimental and productivity may be questioned. An extreme strategy is the choice to remain child free, particularly for those women who are motivated to seek high career achievement (Evetts, 1998; Watts, 2009).

3.3.4 Women's Career Advancement in Engineering

While research has shifted towards understanding why women choose to remain in engineering, there has been minimal focus on women engineers' career advancement and women engineers' experiences in senior roles. Studies exploring women's career progress in engineering are clustered around gendered differences in career paths and career aspirations, and the difficulties women engineers face relating to promotion.

Evetts (1993) suggests that initiating and building managerial careers is difficult for women engineers. She found that promotion criteria for management roles

were unclear, that access to senior level management positions was by invitation only. The stringent conditions attached to achieving advancement to managerial roles in engineering were reported in further work by Evetts. Managers were required to be “committed to the organisation, prepared to work long hours, be mobile and even relocate” (Evetts, 1997, p. 231). Evetts (1998) notes that many participants had trouble with promotion requirements and in reconciling work, career and cultural expectations. As discussed in section 3.3.3.2, some women engineers choose to avoid managerial roles, as they perceive them as unsuitable for women or difficult to combine with family commitments.

An alternative view is offered by Dolan, Bejarano, and Tzafrir (2011). Male and female engineers may differ in their individual career aspirations and success definitions, impacting their organisational advancement. Career success for male engineers was linked to a ‘Getting High’ aspiration characterised by achieving high expertise and being well known. Alternatively, women engineers were more likely than male engineers to associate career success with work/life balance and job security.

Servon and Visser (2011) identified three organisational and cultural barriers to the retention and advancement of women at executive levels within the US private SET sector: corporate culture, isolation and the extreme nature of executive jobs. These findings align with many of the challenges experienced by women engineers in general. Women executives in SET employed mechanisms that enabled them to navigate these concerns. A primary strategy was impression management or behaving like a man, which aligns with findings on women engineers’ adaptation to the dominant masculine culture discussed previously (Miller, 2004; Powell et al., 2009).

A second strategy of “finding a pocket of sanity” (Servon & Visser, 2011, p. 279) involved finding a comfortable place within the organisation where the women could be themselves, or making lateral or downward moves instead of prioritising further advancement. Such strategies support findings of earlier studies (Evetts, 1998; Ismail, 2003; Watts, 2009). The authors state “although

finding a pocket of sanity might work for survival purposes, this strategy may not work very well from the perspective of career advancement” (ibid p. 280).

3.3.5 Summary

This section has examined the literature relating to women in the engineering profession. Investigations into the high attrition of women engineers suggests that the highly masculine culture of the engineering workplace is the source of many of the difficulties encountered by women engineers. Research describing this work environment, and the issues arising from it was discussed. This was followed by a review of the strategies used by women engineers to negotiate and persist within such masculine cultures.

The emerging body of work on women’s persistence in engineering was examined. Self-efficacy, job engagement and commitment, positive expected outcomes, and engineering identity have been found to influence women’s persistence. Research exploring the relationships between professional identity, identity construction and women’s sense of belonging in engineering was considered. Finally, the small number of studies related to women engineers’ career advancement indicated that motivations to reach senior roles may be different for women and men.

The review of the literature relating to women working as engineers reveals that very little is known about women engineers’ career advancement and women engineers’ experiences in senior roles. A key contribution of this research is to begin to build this knowledge. This research will extend the understanding of women’s careers in engineering to include positions of management and leadership and to provide an understanding of the experience of becoming managers and leaders that has not been explored in the women in engineering literature. Further, by considering the successful career progression of women engineers, this research has potential to add to the emerging body of work on women’s persistence in engineering careers.

3.4 Women's Advancement to Management and Leadership Roles

The previous section reviewed of academic literature relating to women's engagement in the engineering profession. In this section, the focus shifts from women engineers to consider the broader literature relating to women's progression to management and leadership roles across a variety of occupations and industries.

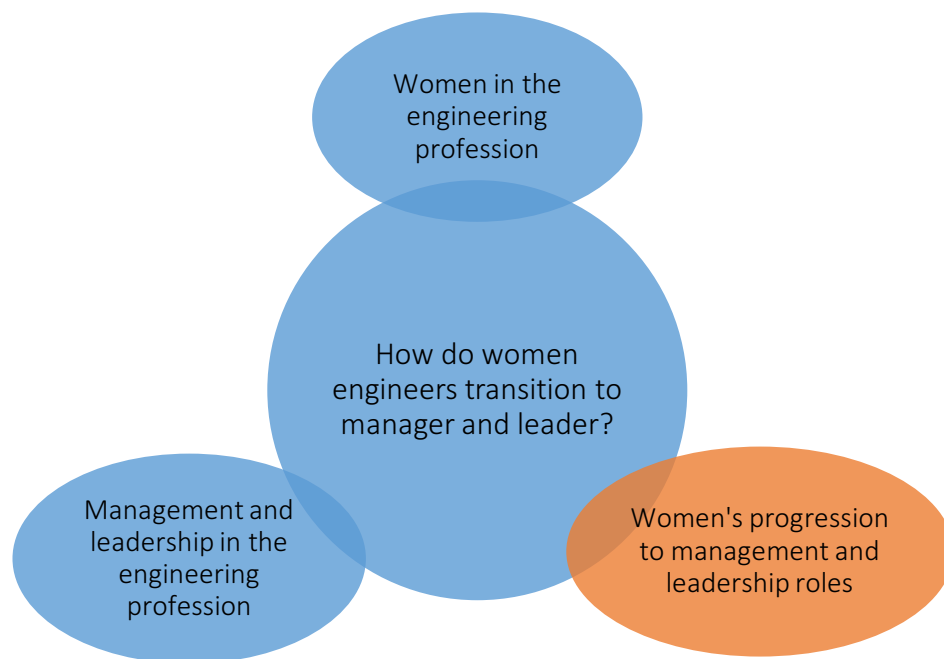


Figure 3.4 - Literature Review Focus: Women's Progression to Management and Leadership roles

Women's progression to management and leadership is embedded in a context of persistent under-representation (see section 2.2.3). Academic research has focused on understanding the reasons for this, and identifying factors that explain some women's success. The review begins by considering research into multi-level barriers and facilitating influences on women's entry and progression within managerial and leadership roles. This is followed by a review of a small number of studies that have moved beyond influential factors to explore women's experiences of becoming a manager or leader.

The "evolution of a new professional identity" (Hill, 2003, p. 7) is a prominent theme in broader work-role transition studies that conceptualise the movement

from one position to another as a process of adjustment, sense-making and identification. An emerging literature examining women's professional identities as managers and leaders is considered. In light of the reviewed literature, the section concludes by considering the potential contributions of this current study.

3.4.1 Multi-level Influences on Women's Progression to Management and Leadership Roles

Researchers have proposed that gender differences in organisational advancement or "promotion into powerful positions" (Ragins & Sundstrom, 1989, p. 59) are explained by influences acting at individual, interpersonal, organisational and societal levels (Ragins & Sundstrom, 1989; Tharenou, 1997, 1999). Key influences are discussed below.

3.4.1.1 *Underlying Societal and Organisational Influences*

Inequities in the access to advancement opportunities and the progression through management reflect underlying societal factors relating to gender, including gender stereotypes, gender linkage of roles and gendered organisational systems and cultures. These broader influences are discussed first and provide a context for the review of empirical studies relating to organisational factors and women's managerial and leadership advancement.

In the workplace, gender stereotypes underlie our beliefs about the roles of men and women at work, and how they should enact these roles (Heilman, 2001). According to gender stereotypic beliefs, women are more communal and less agentic than men. Communal qualities are service-oriented traits such as selflessness, concern for others and helpfulness, while agentic qualities are achievement-oriented traits such as independence, assertion and aggression, and decisiveness (Eagly & Steffen, 1984; Heilman, 2001). Women are expected to display communal or relational behaviours, while agentic behaviours are deemed as inappropriate.

Alvesson and Due Billing (2009) explain “most work is not gender neutral but is attributed some form of masculinity or femininity, either vaguely or in more specific ideas about what the work involves and the kinds of qualities ‘typically’ demanded and believed to be possessed by a man or a woman” (p. 49). The characteristics associated with success in an occupation or role are linked to the associated gender and its stereotypical qualities, and a person of the corresponding gender appears more suitable or qualified for that role.

The attributes associated with leadership and management work are typically masculine (Eagly & Johannesen-Schmidt, 2001). Schein first described the masculine sex typing of managerial roles. Her investigations revealed that men were more likely than women to be perceived as having characteristics associated with managerial success, coining the adage: ‘think manager-think male’ (Schein, 1973, 1975). International replications of her studies have confirmed ‘think manager-think male’ as a persistent and global phenomenon (Schein, 2001).

“If the managerial position is viewed as a “masculine” one, then, all being equal, a male candidate appears more qualified by virtue of such sex typing of the position than a female candidate” (Schein, 2001, p. 676).

The combination of male stereotypic attributes and the male sex typing of managerial roles generates gender bias that obstructs women’s advancement to senior management roles (Heilman, 2001). Agars (2004) concurs stating that “gender stereotypes influence our judgments and evaluations such that, ultimately, we treat men and women differently” (p. 103). Gender bias infiltrates personnel decisions, including promotion, task assignment, identification and selection of potential managers resulting in unequal access to advancement opportunities (Heilman, 2001; O’Neil & Hopkins, 2015). Gender bias is one characteristic of the broader gendered organisational system that serves to undermine women as they seek to advance in leadership positions (O’Neil and Hopkins, 2015).

In addition to difficulties in accessing opportunity, women face a conundrum with respect to the expected behaviours of managers. Women who are successful in obtaining and enacting management roles violate the prescriptive norms associated with gender stereotypes. Successful women are penalised through devaluation of women's performance, denial of credit for their successes, or their penalisation for being competent (Heilman, 2001; Heilman & Okimoto, 2007).

Agars (2004) notes that the impact of gender stereotypes on women's advancement in organisations has been under-examined in empirical research, and that statistical effects have been small or inconsistent. He proposes the re-evaluation of the cumulative impact of gender stereotypes on evaluation decisions over time and across organisations to determine its full effect. Using a hypothetical organisation, Agar demonstrates that at each decision point in a selection and promotion process, "a small number of women who would have been promoted under equal conditions, are not promoted" (p. 107) creating marked disparity over multiple decision phases. He concludes that the cumulative and substantial impact of gender stereotypes result in far fewer women in upper management.

The effect of gender stereotypes is particularly strong when women's representation is at token level (Ely, 1995; Kanter, 1977) and so is pertinent for women working in male-dominated professions such as engineering. While the influence of male hierarchies on women's initial selection into management is contested (Tharenou, Latimer, & Conroy, 1994), women's advancement through management has been found to be positively influenced by the percentage of women within the organisation (Blum, Fields, & Goodman, 1994) and in management roles (Cohen et al., 1998). However, the presence of women in upper management appears to have a limited effect above a threshold level (Cohen et al., 1998; Tharenou et al., 1994).

Organisations have introduced a range of initiatives to improve women's access to managerial positions. As noted in Section 2.2.1, gender equality legislation requires Australian organisations to implement measures for providing equal opportunity in employment for women and to report on these measures. In their

study of the actions of a sample of Australian organisations, Nesbit & Seeger (2007) found little improvement in managerial representation by women despite the use of a wide range of initiatives designed to increase representation, including flexible work arrangements, mentoring, and diversity training. The study uncovered that managerial progression and work-life balance are perceived as mutually exclusive, at both organisational and individual levels. Most top managerial and professional women have access to reduced or flexible schedules but most feel unable to take advantage of these options for fear that it will decrease their career prospects despite the tension and stress of combined work and non-work demands (Marongiu & Ekehammar, 1999). This aligns with the view that women's under-representation in senior organisational positions will persist while the "systemic norms and structures that drive the gendered nature of the workplace" (O'Neil & Hopkins, 2015, p. 1) remain in place.

3.4.1.2 Professional Social Capital

Research suggests that interpersonal relationships, and the social capital arising from these relationships (Kumra & Vinnicombe, 2010), influence women's entry to and progression within management and leadership. Empirical assessments of interpersonal variables present varied relationships between aspects of social capital and women's managerial entry and advancement. Tharenou (2001) and Metz (2003) found that social capital contributed little to the explanation of women's advancement. However, certain forms of social capital such as mentoring and network membership may be more influential than others, have varied impacts at progressive stages of managerial advancement (Tharenou, 2001) or in different organisational circumstances (Metz, 2009).

Mentoring is viewed as essential to women's career success (Ragins, 1999). The presence of a mentor has been linked to increased objective and subjective career success (see Allen, Eby, Poteet, Lentz, and Lima (2004) for a meta-analysis of mentoring career benefits). Singh, Ragins, and Tharenou (2009) found that mentoring was strongly linked to promotion, retention and expectations of advancement within the organisation. In addition to general benefits, mentoring may assist women in addressing career obstacles such as gender stereotyping,

discrimination and reduced organisational power and invisibility which impede women's access to development and capability building opportunities and influential relationships (Metz, 2009; Ragins & Cotton, 1999; Tharenou, 2005).

Recent studies in the Australian context have found that mentoring relationships enhance women's advancement. Burke, Burgess, and Fallon (2006) found that women managers and professionals in early career stages who had a mentoring relationship reported higher levels of job satisfaction, were more optimistic about their career prospects and displayed higher levels of psychological well-being. Tharenou (2005) and Metz (2009) found that women's hierarchical progression was enhanced by mentor career support, but not by psychosocial support.

Gender differences in mentoring experiences may explain women's lower levels of hierarchical advancement. Women may have difficulty in forming mentoring relationships, due to the presence of male hierarchies and exclusion from informal organisational networks (Tharenou, 1999) and their lower power position within organisations (Ragins & Sundstrom, 1989). The type of support received by female mentees and the effect of this support may also differ. Research has suggested that female mentees may receive less mentor career support and more psychosocial support than men (Ragins & Cotton, 1999). This was not supported by a recent meta-analysis of gender differences in mentoring by O'Brien, Biga, Kessler, and Allen (2010) that found no difference in the level of mentor career support reported by male and female mentees, despite women reporting greater levels of psychosocial support.

Having a female mentor may also affect women's mentoring experiences. Women with women mentors tend to report more psychosocial support and greater levels of role modelling (Burke et al., 2006). Further, Tharenou (2005) found that mentoring by women mentors facilitated women's advancement the most, contrasting with previous research that suggested the superiority of a male mentor (Ragins & Cotton, 1999; Ragins & Sundstrom, 1989).

Ibarra, Carter, and Silva (2010) proposed that women require a special type of mentor, suggesting that “high-potential women are over mentored and under sponsored relative to their male peers” (ibid p. 82). Sponsors differ from mentors in that they use their influence to actively advocate for the mentee’s advancement. In the UK, female management consultants identified having a sponsor as vital to their advancement (Kumra & Vinnicombe, 2010). Sponsors were viewed as having a multi-faceted role - they were both a source of opportunity and a protective mechanism against negative situations within the organisation. The need to find the ‘right’ type of sponsor with appropriate reputation and ability to provide required benefits was emphasised. The authors suggested that “it is particularly beneficial to be associated with an established manager and the links this provides to their social networks” (ibid p. 538).

Interpersonal networks formed from colleagues, superiors, professional contacts, friends and family can offer alternative resources to mentors though providing career support and encouragement (Burke, Rothstein, & Bristor, 1995; Singh et al., 2009). These ‘career communities’ (Parker, Arthur, & Inkson, 2004) can affect organisational socialisation and identity development (Ibarra & Deshpande, 2007). Being part of networks may assist women to advance their careers. Burke et al. (1995, p. 25) states: “if women are excluded from male networks, they may be missing several ingredients important for career success. These would include knowledge, information, resources, support, advice, influence, power, allies, mentors, sponsors and privilege”.

There is mixed support for the influence of internal and external networks in women’s career and managerial advancement. From the perspective of female managers, organisational support networks are perceived essential to their career development (Linehan, 2001) and internal and external networks are associated with perceived career success (Eby, Butts, & Lockwood, 2003). Involvement in networking behavior was found to be more beneficial for the career progress of men than women (Forret & Dougherty, 2004). Further, women’s lack of advancement to management has been linked to difficulties in accessing networks within the organisation and informal relationships with male colleagues (Linehan, 2001). In contrast, Metz (2003, 2009) did not find a

connection between network membership and women's advancement. Similar conclusions were drawn by Burke et al. (1995), who found that managers' interpersonal networks did not affect a range of objective and subjective aspects of career success.

Other research has examined the differences in the networks of successful men and women. Ibarra (1993) found differences between the network characteristics of 'high-potential' and 'non-high potential' men and women. High potential women were found to have wider ranging networks - they were more likely to develop networks of contacts outside of their current organisations and people within their networks were more varied. High-potential women were also found to have stronger connections to other women, suggesting that women may gain benefit from the experiences of other women who had faced similar difficulties.

The mixed results of empirical studies investigating social capital and women's career advancement suggest that further work is required to understand the relationships between interpersonal variables, other influencing factors and women's managerial advancement.

3.4.1.3 Individual Factors

Metz (2003) states "women's managerial advancement is principally related to factors in the individual environment" (p. 249). Women's entry and advancement through management roles has been linked to personality traits, women's levels of managerial aspiration or ambition, human capital, and family commitments to women's managerial progress across a range of occupations and countries.

An instrumental personality profile, associated with masculine traits such as assertiveness, competitiveness and task-orientation, has been identified as key positive influence on women's entry to management (Marongiu Ivarsson & Ekehammar, 2001; Marongiu & Ekehammar, 1999; Tharenou, 2001). Marongiu and Ekehammar (1999) found that it was important for women to combine an instrumental orientation and an aspiration to pursue a managerial career. Having a pronounced managerial aspiration may be required for recognition by the

organisation as a potential manager or to counteract the 'push' of combining paid work and family responsibilities. Tharenou (2001) also recognises the role of women's high management aspirations.

While research suggests that managerial aspiration is particularly important for women, measurable gender differences in aspiration to management roles are contested. Some researchers have found that women are less likely to aspire to top management roles (Litzky & Greenhaus, 2007; Powell & Butterfield, 1981, 2003). Litzky and Greenhaus (2007) found that women's lower aspirations for promotions were connected to their perceived lack of fit with senior management roles and view that promotion to management is less attainable. Other studies indicate no significant differences in men and women's management aspiration (Marongiu & Ekehammar, 1999; Powell & Butterfield, 2013). Powell & Butterfield (1981, 2003, 2013) identified that sex-role identity rather than biological sex was a better predictor of managerial aspiration. The authors found that " 'masculine sex-typed' individuals - those whose self-concept favours masculine over feminine characteristics - may aspire to higher levels of management because the characteristics associated with the management role are more congruent with their masculine self-image" (Powell & Butterfield, 1981, p. 299).

Women's managerial advancement has also been related to human capital. Human capital theory (Becker, 1962) links the accumulation of work-related knowledge and skill, through activities such as education, training and years of work experience to increased earnings and wealth. Metz (2003) found that women's advancement was primarily related to their human capital accumulated through training and development activities, and work experience. Opportunities for skill and development such as training and management development programs have been found to have a greater influence on promotion of women than men (Blum et al., 1994; Cohen et al., 1998; Malach-Pines & Kaspi-Baruch, 2008).

Human capital variables may have differential influence according to stage of managerial advancement. Metz and Tharenou (2001) found that the frequency of participation in training and development opportunities and occupation type

were indicative of entry into management positions, while work hours, years of work experience and breakthrough career experiences were linked to progression through junior and middle management. Howard and Wellins (2009) found that women were less likely than men to receive training as they transitioned into higher-level positions.

Further studies have assessed the combined action of individual level factors on women's managerial advancement. Metz (2004) examined the influence of ambition, masculinity and adaptability traits and human capital in the Australian banking industry. Her findings support previous research linking personality traits to women's managerial advancement, but also highlight the relationship between individual qualities and human capital. She found that women who display masculinity and adaptability obtain greater managerial advancement, because they seek out and participate in more training and development. Further, women with high masculinity and adaptability were found to gain greater advantage from their work hours.

Family responsibilities including child and elder care, described as women's multiple roles (Tharenou, 1997), are frequently cited as a barrier to women's advancement. Women may limit work to cope with additional domestic responsibilities (Kellerman & Rhode, 2007) resulting in decreased cumulative work experience, impacting work continuity, availability and flexibility (Kelliher & Anderson, 2008). However, evidence of the influence of family status and family responsibilities on women's managerial advancement is mixed. Tharenou (1999) found that married women, with or without children, advanced more than single, childless women. In contrast, Metz (2003) did not establish a relationship between women's managerial advancement and marital status or number of children.

When comparing managerial and non-managerial women, Marongiu-Ivarsson and Ekehammar (2001) found that work/family pressure was lower in managerial women. Women with high work/family pressure may opt not to pursue managerial roles, or may be selected out by the organisation. Support at home in the form of domestic help, assistance with care of dependants or spousal

support is related to women's advancement (Marongiu & Ekehammar, 1999; Tharenou, 1999). Tharenou (1997) suggests "multiple roles do not directly impede women's advancement into management compared to men's, but may impede factors that lead to it" (p. 23).

3.4.2 Women's Experiences of Becoming a Manager and Leader

There has been limited attention to women's experiences of becoming a manager or leader. Research examining the early experiences of new managers and leaders have identified the learning, adjustment and evolution that follows entry to management and leadership roles (Benjamin & O'Reilly, 2011; Corlett, 2009; Hill, 1992, 2003; Watson & Harris, 1999). However, these experiences are not well understood from women's perspectives. A small number of studies have explored women's experiences of becoming managers (Priola & Brannan, 2009), and leaders, focusing on "high-flying women" (Coleman, 2011, p. 14) or academic women (Lord, 2007).

Priola and Brannan (2009) explored the experiences of female managers working primarily in junior and middle management roles across a range of sectors in the UK. They described the factors that drew them towards managerial careers, sustained their endeavours and the difficulties associated with their progression. The "seductive aspects of management" (ibid p. 389) included the enticement of organisational power and status and the ability to influence and control others. Challenges were associated with gendered organisational practices, mostly described as masculine workplace cultures, associated competitive and long hour work environments, and low expectations of women managers held by supervisors. Further, a lack of practical and emotional support from early career was cited.

These challenges are echoed in Coleman's study of 60 high-flying women in the UK (Coleman, 2011). Coleman's leaders also describe their interactions with gendered organisational cultures founded on a "bedrock of stereotypes" (ibid p.15) and biases, highlighting that the negotiation of gendered organisations and workplace cultures persists from early career to executive level. These findings

align with Howard and Wellins (2009) who found that up to fifty percent of women leaders found transitions into higher-level positions difficult or very difficult and felt generally unsupported by their organisations.

These studies have also identified many facilitating factors and these align with previous discussion. From the women's perspective, the most important success factor arising in both studies was their own agency - "their determination and drive, their hard work and appropriate qualifications" (Coleman, 2011, p. 45). Further, support at work in the form of mentoring, coaching and networking were noted as important to their career development and success.

Extending beyond barriers and facilitating factors, Lord (2007) extends a phenomenological lens to women academics' experiences of "entering and engaging in leadership" (p. 5) in Australian universities. Her research describes women's process of moving into leadership roles, their development and experiences after appointment within the "contested space" (p. 192) of being a woman in the university context. Lord's four-stage model describes how women enter and engage with leadership. 'Stepping' describes the process of entering leadership roles, which may be triggered by themselves or by the influence of others, and facilitated by a range of motivating factors. 'Settling' captures the period when the women establish themselves in their new role. This includes understanding the requirements of the job, learning the job, juggling the demands of the role and determining how to enact the role of developing a leadership style. 'Strengthening' involves identifying aspects the women see as important to their enactment of leadership (p. 111). 'Sustaining' describes elements that support women, and supporting activities performed by women in their role as leaders.

While the model echoes themes of adjustment and transformation presented in work-role transition research (Louis, 1980; Nicholson, 1984; Nicholson & West, 1988), a point of difference is the context of the 'contested space' that this process occurs within. Lord describes the contested space as a place of tension between the women's expectations of leadership, other's expectations of leaders, and the lived leadership experience. Because of this tension, women leaders experience "ongoing negotiation of their legitimacy as leader" (Lord, 2007, p. 192).

The challenges and tensions highlighted by women entering and progressing in management and leadership have some similarities to those identified in management and leadership transition studies that shape the current understanding of the experience of becoming a manager and leader. These studies identify issues associated primarily with the nature of the managerial role and relational challenges, but do not consider the significant influence of gender on the transition experience.

Hill (2003) described three 'surprises' encountered by new managers that encapsulate the source of these issues:

1. Learning what a manager's daily life was like.
2. Becoming aware of subordinates' expectations.
3. Becoming aware of superior's expectations.

Several studies have noted the challenge of understanding and adjusting to the tasks and nature of managerial work. Hill (2003) noted that new managers were confronted with complex and demanding responsibilities different from those of their previous individual contributor role, and were challenged by the "overload, ambiguity, and conflict" (p. 51) inherent in managerial roles. Watson and Harris (1999) made a similar observation, with new managers struggling to maintain a sense of control over their work, due to its volume and unpredictability. Corlett (2009) found that moving into management roles was accompanied by feelings of responsibility, described by some managers as the "weight of management" (p. 129). Others described an acute sense of "needing to have the answers" (p. 130) or expressed concerns about knowledge and ability, stemming from a desire to appear confident, experienced and in control.

Managing others is a key challenge encountered by new managers. Difficulties range from the general challenge of managing "bloody human nature" (Watson & Harris, 1999, p. 79) to issues with certain problematic employees, dispensing discipline or delivering bad news. Challenges also arise from relationships in the broader organisation, encompassing organisation politics and competitiveness with peers (Watson & Harris, 1999). Echoing the experiences of Hill's and Watson

and Harris' managers, Corlett (2009) found that the change in positioning within the organisation generated challenges to authority from subordinates and feelings of isolation. Further, a lack of support from others was felt.

A further issue identified in these studies was the need to understand, adjust to and juggle others' expectations of the role of a manager and how this should be accomplished. Andersson (2010) summarises the challenges arising from the expectations of others:

"What a manager is, or becomes, might be then a combination of what the context requires, what individual managers feel they should be, and what other organizational members want them to be" (p. 169).

Hill (2003) highlighted the conflicting expectations of team members and superiors of a manager's role and focus, while Watson and Harris' study emphasised challenges arising from a lack of clarity of other's expectations of what a manager should achieve and how they should achieve it. Poorly defined roles or ambiguous objectives from senior management conflicted with new managers' desires to perform efficiently (Watson & Harris, 1999).

Merging of these literatures highlights the absence of women's perspectives in the current understanding of manager and leader transition, the lack of consideration of the gendered context of their leadership experience and suggests that women experience an added layer of challenge and complexity resulting from negotiating gendered workplace terrain.

3.4.3 Women's Managerial and Leadership Identities

The "evolution of a new professional identity" (Hill, 2003, p. 7) is a recurring theme in management and leadership transition studies. Becoming a manager or leader is considered by some researchers as an identity transition, a period of identity threat, or a process of identity work towards a managerial or leader identity (Corlett, 2009; Ely, Ibarra, & Kolb, 2011; Ibarra, 1999; Ibarra & Petriglieri, 2016; Lord & Hall, 2005).

Manager and leader identities are described as the part of a person's identity that relates to what it is to 'be' a manager or leader, or how one thinks of oneself as a manager or leader (Day & Harrison, 2007; McKenna, Garcia - Lorenzo, & Bridgman, 2010). These identities are conceptualised as constantly emerging (Andersson, 2010; McKenna et al., 2010), fragmented and fluid (Alvesson & Willmott, 2002) and characterised by contrasting positions or antagonisms (Clarke, Brown, & Hailey, 2009).

Developing a leader identity depends on seeing oneself, and being seen by others, as a leader (Ely et al., 2011). This is achieved through a "recursive and mutually reinforcing" (ibid p. 476) process of action and affirmation akin to the professional identity development process described by Ibarra (1999). This is extended by DeRue and Ashford (2010) who conceptualise three components of leadership identity: "individual internalization, relational recognition, and collective endorsement". The successful development of a new manager or leader identity is associated with career success (Ibarra, 1999; Kyriakidou, 2012).

Research suggests that the development of manager and leader identities by women is characterised by additional challenge. Women managers and leaders may have difficulty in perceiving themselves as manager and leaders, and in being seen by others as such, in these roles (Ely et al., 2011; Ibarra & Petriglieri, 2016).

Studies exploring women's managerial identity centre on the dualistic nature of the manager identity and identity as women. These identities are presented as conflicting and as generating tension requiring negotiation by individual and collective coping strategies (Karelaia & Guillen, 2014; Priola, 2007) that are viewed as largely ineffective and may act to reinforce conflicting identity positions and reproduce gendered practices (Fournier & Kelemen, 2001).

The influence of gender on the formation of career identities for women managers is highlighted by Wajcman and Martin (2002) and Ross-Smith and Chesterman (2009). Wajcman and Martin conclude that women managers' career

and private identities are entwined and that women managers “construct workable self-images by reducing emphasis on one or other of the public and private identities available to them” (Wajcman & Martin, 2002, p. 997). The tension between managerial and gender identities may manifest as expressions of reticence and ambivalence to career success by outwardly successful women (Ross-Smith & Chesterman, 2009).

Development of leader identity is typically associated with senior women, or those approaching top organisational roles. Ely et al. (2011) posit that the gendered structures of organisations, including male hierarchies, gender stereotypes, sex-typing of roles and subtle gender biases can interfere with the identity development of women leaders. The authors draw on identity development and gender bias literature to identify issues that inhibit women’s leader identity development. Challenges include the lack of role models for women, gendered career paths and gendered work, and women leader’s heightened visibility.

Ibarra and Petriglieri (2016) introduce the concept of ‘impossible selves’ to describe the unattainable leadership identities and behaviours associated with a masculine organisational model of success in male-dominated firms. Observing role models is a key step in professional identity formation associated with new roles (Ibarra, 1999). Further, “people in senior leadership positions serve as role models for what it takes to succeed” (Ibarra & Petriglieri, 2016, p. 2). In organisations that are predominantly male, or have male-dominated hierarchies, women have difficulty accessing congruent role model behaviour or ‘identity matches’. The connection between availability of role models, identity development and women’s progression to top organisational roles is further explored by Sealy and Singh (2010). The authors highlight that the mechanisms by which role models influence professional identity formation are not well understood.

Ibarra & Petriglieri’s study of men and women transitioning to more senior leadership roles revealed that women employed different identity strategies to men to adjust to these roles. Men were more likely to use ‘role modelling’ identity

work strategies, while women used 'true to self' strategies that maintained their authenticity and credibility with clients. The authors point out that these strategies are disadvantageous as they do not align with the accepted organisational norms.

Leadership development programs are a space for leadership identity construction (Ibarra & Barbulescu, 2010; Moorosi, 2014; Petriglieri, 2011). Women-only leadership programs are proposed as a key resource for assisting women overcome the identity work challenges experienced when transitioning into senior leadership (Ely et al., 2011).

3.4.4 Summary

This section examined the literature relating to women's advancement to management and leadership within organisations. It merged two areas of research which are largely separate – studies about women's managerial advancement, and those focused on the transition to manager and leader, or becoming a manager and leader.

Firstly, the empirical research of factors that affect both women's entry to and advancement within management and leadership roles was considered. This work has established that multi-level barriers and facilitators influence women's advancement. This was followed by a review of studies that explore women's experiences of becoming a manager or leader. While researchers have sought to understand the early experiences of manager and leaders, and have identified many associated challenges, these early experiences are not well understood from women's perspective and there has been a lack of consideration of the gendered context of their experience. Finally, literature related to managerial and leadership identities was examined. The emerging literature sub-set considering women's professional identity suggests that identity development may be more challenging for women and has identified tensions between career, private and gender identities.

Merging of these literatures highlights the absence of women's perspectives in the current understanding of manager and leader transition, the lack of

consideration of the gendered context of their leadership experience and suggests that women experience an added layer of challenge and complexity resulting from negotiating gendered workplace terrain. Studies interested in women's managerial and leadership advancement are largely focused on predictive factors, while studies in the broader realm of transition to manager and leader have moved beyond this to consider early experiences of adjustment and change. By focusing on women's experiences, this study will continue to extend the current understanding of women's advancement into management and leader roles beyond predictive factors. It also has the potential to add to managerial and leadership transition knowledge, by introducing the perspective of women in a specific, highly gendered professional context.

3.5 Becoming a Manager and Leader in the Engineering Profession

The movement away from technical roles into managerial role is very common for engineers, with most engineers becoming managers at a certain stage in their careers (Badawy, 1981; Srour et al., 2013). Analysis of career histories of engineers suggests that engineers typically spend five years in technical roles before moving into a management role (Lannes III, 2001; Reese, 2003).

In this section, the literature relating to becoming a manager and leader in the engineering profession is considered. The purpose of this review is to summarise and evaluate this literature to establish what is known about the transition from technical engineering roles to management and leadership roles.

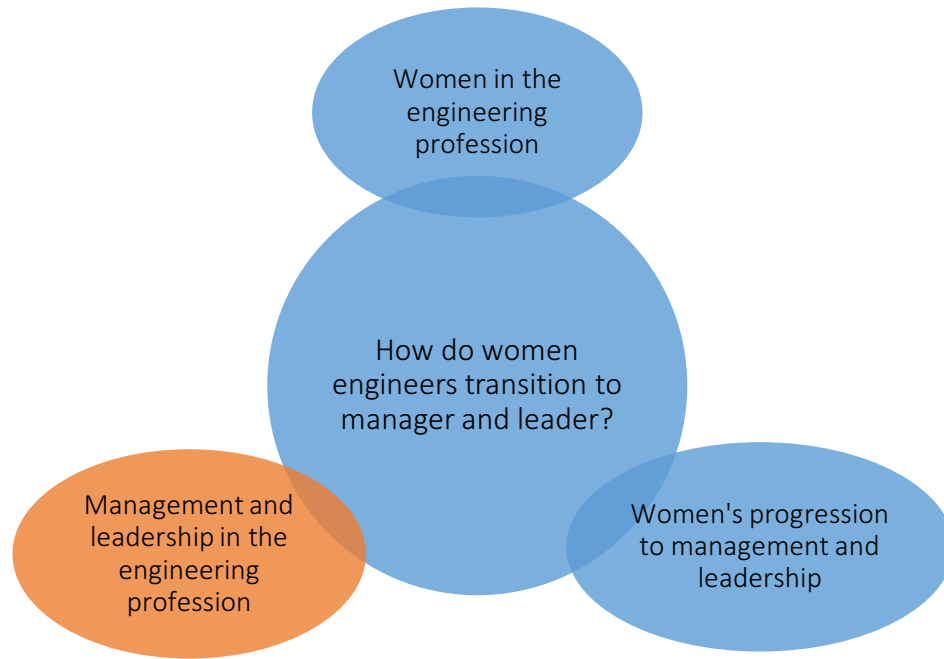


Figure 3.5 - Literature Review Focus: Becoming a Manager and Leader in the Engineering Profession

This section of the literature review begins by considering research relating to the engineer to manager transition. Despite its frequency, this literature presents the transition primarily as a dilemma or unfavourable career move that often ends in failure. An emerging literature considers management a desirable pathway for engineers, which is essential for the successful operation of technical organisations. This review begins by exploring this dichotomy.

With a view to improving the success rate of the engineer to manager transition, researchers have sought to understand the challenges encountered by engineers, their motivations for this career move, and the factors that influence the transition experience. Research relating to these areas is reviewed. Then, an emerging literature relating to engineers and leadership is considered. This section concludes by outlining the potential contribution of this study on women engineers' transition to managers and leaders, to the current understanding of becoming a manager and leader in the engineering profession.

3.5.1 Transition from Engineering to Management

Much of the earlier literature on the move to management by engineers, becoming a manager is conceptualised as leaving the engineering profession. It is described as a shift to the managerial path or “track switching” (Biddle & Roberts, 1994), an “exodus of engineers from their original profession” (Johnson & Sargeant, 1998, p. 41), and a “massive occupational shift” (Rynes, 1987, p. 138). This change is frequently presented as a dilemma for individuals and organisations, or as an undesirable career move that often ends in failure.

3.5.1.1 *Transition from engineering to management as a dilemma*

Badawy (1995) describes the transition of engineers to managers as a formidable task and challenge for management. The dilemma of becoming a manager in engineering may stem from the historic tension between engineering and managerial functions (Hodgson et al., 2011) arising from differences between engineering and managerial work and the lack of suitability of engineers for managerial roles. Morrison (1986) outlines the differences between engineer and manager roles in terms of several criteria including role focus, responsibility and outcomes. Engineering roles are defined as having a technical focus, fact-based decision making to achieve quantifiable outcomes. In contrast, managerial roles are perceived as having a higher interpersonal reliance, and greater ambiguity and uncertainty (Evans & Bredin, 1987).

The literature ascribes the engineers’ lack of suitability for management to incompatible traits, orientations and motivations and a lack of requisite skills. Engineers are seen as being oriented towards technical rather than organisational goals (Roberts & Biddle, 1994). According to Morrison (1986) engineers will typically work individually and autonomously to solve problems, drawing on their technical expertise and attention to detail to achieve outcomes. Research on the career orientations of technical people suggests that the ideal job is characterised by “challenging work, technical expertise, good interpersonal relations, open communication, tangible rewards and clear roles” (Yeh, 2008, p. 84). The practical orientation of engineers is emphasised by Floyd and Spencer

(2014), who note that the most successful engineers in the technical ladder are engineers that like “dirt under their fingernails” (p. 25).

Different skills are perceived as necessary to perform managerial work. Thamhain (1991) developed a skill inventory for engineering managers, encompassing leadership, technical and administrative skills. The technical focus of engineering may leave engineers ill-prepared to deal with the increased breadth and priorities of a managerial role (Lea, 1991; Morrison, 1986). Engineers may lack required interpersonal skills (Roberts & Biddle, 1994), teamwork orientation, and the ability to communicate and interface with a new team, more senior managers and peer managers (Morrison, 1986). Other research emphasises a lack of business management and leadership skills (Farr & Brazil, 2009; Roberts & Biddle, 1994) and skills relating to decision making (Srouf et al., 2013). Further, Morrison (1986) notes that new managers do not receive sufficient training and preparation, suffering from a lack of exposure to supervisory tasks and lack of clarity of the expectations and responsibilities of a management role.

3.5.1.2 An alternative perspective

An alternative perspective presented by some authors is that engineers are well suited to managerial positions, particularly in technical organisations. Badawy (1981) suggests that engineers’ analytical and organisational skills endear them to managerial work. Engineers’ technical expertise is seen as beneficial by some researchers. Biddle and Roberts (1994) provide evidence that technical and managerial productivity are positively correlated with more successful technical workers becoming more successful managers. Technical expertise is viewed as a required resource for managing other technical people, particularly as a source of credibility and respect from others on account of their technical knowledge (Mael, Waldman, & Mulqueen, 2001). Further, managers with technical knowledge are perceived as essential for the successful operation of technical organisations and development of new technology (Kocaoglu, 1994).

Recent research in the field of engineering practice questions this division between management and engineering work. Rather than separate and incompatible, analysis of engineer's work suggests that technical coordination is the basis of engineering work and that most engineers perform both managerial and technical tasks from early career (Trevelyan, 2007, 2010; Williams & Figueiredo, 2011). This gradual broadening of engineering roles is a recognised career path within the engineering profession, described by Engineers Australia as "a transition to a less technical and a more managerial role" (Eng Exec 2011). Seethamraju (2004) describes the changing roles of engineers in modern organisations, and the blurring between technical and managerial roles. This conceptualisation of engineering work as a hybrid technical-managerial is not considered in engineer-manager transition studies. Instead, the majority of studies consider the transition as leaving one role or profession (engineering/technical) and entering a different and incompatible one.

3.5.2 Challenges of the Engineer to Manager Transition

The dissonance between the qualities and skills of engineers and the nature of managerial work is presumed to result in problems during transition that may affect the individual experiencing the transition and their organisation. Encountering difficulties may result in work-related dissatisfaction or poor performance (Bailyn & Lynch, 1983). Engineers that do not meet the performance expectations of their organisations may become derailed (Shipper & Dillard Jr, 2000; Yeh, 2008). From an organisational-level perspective, the transition into management of scientists and engineers has been questioned as an efficient use of human resources citing that the transition can result in a waste of technical investment, or the promotion of mediocre people into positions of influence (Roberts & Biddle, 1994).

Howard (2003) observed that there was limited research on the nature of the engineer-manager work-role transition and that the presumed sources of difficulty are not supported by empirical research. To fill this gap, Howard explored the challenges experienced by five engineers who had become engineering managers in the American aerospace industry. Using a

phenomenological approach, he identified nine key challenges experienced by engineers during the engineer-manager transition. These are listed in Table 3.1, ranked in order of perceived difficulty:

Table 3.1 – Challenges Experienced by Engineers Transitioning into Management Roles (from Howard 2003, p. 212 & p. 232)

Primary Challenges	
1. So much going on	the engineering manager role involves balancing many more responsibilities, tasks, and priorities than the engineering role
2. Relationship changes	personal relationships, interaction, dynamics, and engineer perceptions of you have changed
3. Delegation	the challenge of leaving the hands on technical behind and learning to work through others
Common Challenges	
4. Increased stress and pressure associated with increased responsibility	increased responsibility and ownership, having to meet deadline and timeframes resulted in increased pressure and stress
5. Developing new skills	discovered the need for a new set of skills as a manager
6. Resources and getting the work done	finding the time, the staff and other resources to get it done
7. The new guy in management	change from being a technical expert to being new in management and having a lot to learn
Possible Challenges	
8. Organizational issues	in a new organizational level with its associated issues
9. Choosing the management career path	the concerns before deciding and questions experienced during or after the transition

Wilde (2009) built on Howard's work to gain a better understanding of the difficulties experienced by engineers as they transitioned into formal management positions. Wilde asked 225 engineering managers working in a large technical organisation in the USA to rank eight of Howards' challenges by level of difficulty. There was some common ground between the findings of the two studies. In Wilde's study, the most difficult challenges were identified as i) leaving behind the technical work, ii) balancing all of the responsibilities and iii) the increased stress and pressure associated with their management roles. This aligned with Howard's challenges of 'So Much Going On' and 'Delegation'.

However, Wilde's respondents did not rate changes to relationship dynamics as a 'most' difficult challenge.

Wilde also assessed the links between transition challenges. He found that the challenge of 'the development of managerial skills' was significantly correlated to all of the other challenges. That is, those engineering managers who identified development of their managerial skills as a particular challenge were likely to experience greater difficulty with other transition challenges. Wilde points out that focusing on the identification of and development of the required managerial skill set has the potential to significantly "ease the pain associated with the transition" (ibid p. 92).

3.5.3 Motives for Becoming a Manager in the Engineering Profession

To lessen the difficulties associated with the transition, or increase their rate of success, several studies have explored career orientations and management aspirations of technical people and the motivations for their transition to manager. These studies are based on the premise that some engineers are better suited to management than others and that the rate of successful transitions can be improved by identifying those with high managerial potential and aspiration. Managerial aspiration is viewed as an important indicator of a successful transition (Thamhain, 1991). Understanding the reasons why engineers decide to take on management roles may have implications for their transition experience.

Mael et al. (2001) studied motivational factors and aspiration to management roles. This study found that those who aspire to management tend to be more highly motivated for power and influence, desire for upward mobility, motivation for security and respect, and need for dominance. Rynes, Tolbert, and Strausser (1988) determined that managerial aspiration can be identified prior to commencing employment. They identified factors that differentiated engineering students that aspired to management versus technical pathways, supporting previous work indicating that engineer-manager transition is pre-dispositional (Rynes, 1987).

A primary reason for those that have made the move to manager is the truncated technical career path within organisations. Bailyn and Lynch (1983) indicated that engineers frequently moved away from the technical path and into management due to the limited career progression available for technical people. For engineers, management roles may be a symbol of career success and provide the avenue for organisational incentives such as status and authority, and increased income (Roberts & Biddle, 1994)¹⁰. Johnson and Sargeant (1998) identified dominant motives for transition into management of engineering managers in the UK context to be: 'to progress my career', 'money', and 'increased status'. Almost 50% of respondents indicated that the transition was 'a natural transition' signalling that the move from technical roles into managerial roles is a dominant career path within technical organisations. In the US context, Wilde (2009) found that the primary reasons given by engineering managers for entering management were 'personal development' and 'I was asked to'. In contrast to the findings of Johnson and Sargeant (1998), only a small proportion of engineering managers cited better pay as a motivation.

Wilde (2009) also found that an individual's motivations for entering management was linked to the perceived difficulty of key transition challenges. Engineers that entered management because 'they were asked to' reported more difficulties relating to new relationships, developing new skill sets and managing resources, than engineers who were motivated by personal development, supporting previous work linking managerial aspiration to a successful transition (Rynes, 1987; Rynes et al., 1988; Thamhain, 1991).

3.5.4 The Experience of Transition

The previous sections have highlighted that while many engineers make the transition from engineer to manager during their careers, it is perceived as a dilemma for individuals and organisations. Research has revealed the challenges experienced by engineers making this move (Howard, 2003; Wilde, 2009), and

¹⁰ The theorising of the 'dual career' track by Allen and Katz (1986) was a suggested solution to this problem.

the motivations or predictors associated with successful managerial transitions within the engineering profession (Johnson & Sargeant, 1998; Rynes, 1987; Wilde, 2009). However, few studies have established the factors that influence the transition from engineer to manager or provided an understanding of the transition process.

An exception is work by Seethamraju in the Australian context. Seethamraju (1997) employed a mixed-method, field-based approach to explore the factors that influence the transition of engineers into management roles, and how those factors operate. His study concluded that the engineer-manager transition is influenced by a combination of individual, educational and organisational factors, overarched by societal factors.

A key individual factor was an engineer's orientation towards managerial roles. Seethamraju found that in general, the engineers in his study were reluctant to move towards more 'generalist roles' and away from technical aspects of engineering work (ibid p. xxi). However, a range of affiliation towards management roles was observed. The move to manager was seen by many as inevitable and motives for moving included "higher pay, status and prestige, rather than dissatisfaction in engineering work" (ibid p. xxi), supporting previous findings.

From the perspective of the engineers participating in the study, engineering education lacked the necessary focus on 'non-technical' or 'soft-skill' training. The narrow focus of engineering curricula may serve to reinforce a "narrow professional mentality" (ibid p. 235). Further professional development such as management qualifications were seen to benefit engineers by increasing their standing in organisations, countering the perception of engineers' lack of managerial skills, and impacting promotion opportunities.

Within organisations, the author found that transition management was primarily the responsibility of the individual engineer, "with minimum or negligible support and resources provided by Australian organisations" (ibid p. xxii). At a broader level, the status of engineers was an important influence on the

engineer-manager transition. The author noted that the image of engineers in Australian society is generally negative. However, in organisations where engineers were held in high esteem, successful transitions were more likely.

A further observation made by Seethamraju, is that the transition from engineer to manager is a continuous process. That is, transition involves jobs with increasing managerial work and that this building of managerial experience is critical to a successful transition. This contrasts with much of the earlier research that represents the transition as a sharp delineation between engineer and manager roles (Allen & Katz, 1986; Badawy, 1981; Biddle & Roberts, 1994; Rynes, 1987) but aligns with more recent engineering practice research that describes management and coordination as inherent to engineering work (Trevelyan, 2007, 2010; Williams & Figueiredo, 2010, 2011).

3.5.5 Becoming a Leader in the Engineering Profession

In contrast to engineers' transition to management, there are a small number of publications relating to engineering leadership. This area is emergent and fragmented. Most published research on the topic focuses on the need for engineers' leadership development, suggesting that engineers are perceived as lacking leadership competencies (Farr & Brazil, 2009; Farr, Walesh, & Forsythe, 1997). Some highlight a disparity between industry requirements of engineering graduates and perceived engineering graduate competencies and call for the inclusion of non-technical training in undergraduate engineering education curriculums (Male, Bush, & Chapman, 2011a, 2011b). Other authors discuss the need for the continual development of leadership skills of practicing engineers (Farr & Brazil, 2009).

Several researchers have proposed frameworks or approaches for leadership development of engineers. Farr et al. (1997) present a framework of nine leadership qualities for engineers. According to the authors, the nine qualities of: big thinker, ethical and courageous, masters change, risk taker, mission that matters, uses power wisely, team builder, good communicator and decision maker, define a good leader, and can be used to identify areas of leadership

development. A further descriptive piece by Ivey (2002) suggests that five aspects of leadership are important for leaders in technical industries: integration, innovation, importance, intensity and integrity.

Farr and Brazil (2009) suggest a process for developing leadership qualities in engineers based on a framework developed by the Center for Creative Leadership that is comprised of three stages: assess, challenge, support. The authors propose a range of situations for leader development through the engineering career path, arguing that development should commence at undergraduate level to establish the importance of leadership skills and development from early career.

Other authors have proposed ways in which engineers should lead. Connecting to existing leadership theory, Breaux (2006) recommends that future and current engineering leaders adopt a transformational leadership approach. The reasons for the author suggesting this approach over other leadership theories is not clear, however he suggests that transformational leadership is a suitable template for effective leadership within dynamic and diverse engineering work environments.

Rottmann, Sacks, and Reeve (2015) however, argue there is a lack of conceptual understanding of engineering leadership, and of the ways in which engineers lead. Farr et al. (1997) hold a similar view, stating “developing a concise definition of leadership for people involved in technical engineering management is difficult” (p. 38).

In order to remedy this lack of understanding, Rottmann, Sacks, and Reeve (2015) adopted a grounded theory approach to conceptualise engineering leadership from the perspective of professional engineers. Initial discussions with practicing engineers revealed resistance to the idea of leadership and to existing definitions of leadership. The basis of this resistance was a dissonance between prevailing discourse on leadership - perceived as “imprecise, impractical, elitist” (ibid p. 356) - and their strong professional identities as engineers.

“Engineer’s leadership capacity more often stems from their subject matter expertise, organisational location and co-ordination responsibilities than from their social status or charismatic personalities” (ibid p. 365).

The authors found that engineers did not relate to traditional performances of leadership, rather they defined leadership in terms of “professionally-recognised forms of influence” (ibid p. 362) and related leadership to actions rather than formal organisational roles.

Three engineering leadership orientations were identified, summarised in Table 3.2:

Table 3.2 - Three Leadership Orientations (Rottman et al., 2015)

Leadership Orientation	Who?	How?
Technical Mastery	“Engineers, who are strongly oriented to the technical elements of their jobs, and have been recognised by others as competent in this realm” (p.358)	Inspiring others Informal and formal mentorship
Collaborative Optimisation	“May occupy formal positions as team leaders or they may simply be known as catalysts for effective self-organizing teams” (p.360)	Assemble high performance teams by leveraging the strengths of others
Organisational Innovation	“The engineer whose creative ideas drive the company” (p.359)	Influence organisational practices and culture by challenging the status-quo

The authors theorise that 'engineering leader' is a compound professional identity that combines the professional identity of engineer and "alternative, professionally meaningful conceptions of leadership" (p. 362).

Women's understandings and experiences of engineering leadership have not been considered in the engineering leadership literature, but some insight into gendered differences in motivations and challenges for aspiring engineering leaders have emerged from post-hoc analysis.

Reeve, Rottmann, and Sacks (2015) describe some gendered differences in leadership orientations. Over 60% of women engineers in their study associated leadership with the 'collaborative optimisation' orientation, as compared to 39% of male engineers. The orientation of 'collaborative optimisation' is related to building teams and facilitating team performance and leaders with this orientation "skilfully strike the balance between humanistic and technical aspects of the profession" (Rottmann, Sacks, & Reeve, 2015, p. 360). In this study, women engineers' perception of engineering leadership is associated with teamwork and collaborative processes. The authors describe this orientation as most closely linked to the ideal of engineering leadership described by industry bodies.

In contrast, male engineers in this study were more likely to associate leadership with technical mastery, particularly in early career. This is aligned with the emphasis on technology by engineers viewed as central to engineering workplace culture and organisational power (Faulkner, 2007, 2009a, 2009b; McIlwee & Robinson, 1992).

Some potential difficulties for women aspiring to engineering leadership roles were highlighted by Rottmann, Sacks, Simpson, and Reeve (2015). As part of a multi-stage study on engineering leadership, participants were asked to identify characteristics of esteemed engineering leaders. Post-hoc analysis of this data revealed that women were underrepresented in engineers' identification of exemplary engineering leaders, at levels beyond those expected based on workforce demographics/ distributions.

The authors suggest that women engineers are not viewed as exemplary engineering leaders due to the “perceived incongruity between gender roles, leadership roles and engineering identity” (ibid p. 8). That is: women engineers are not perceived as natural leaders, and they are judged more critically for behaving as leaders, that the engineering identity is inherently masculine and women’s expertise is evaluated less favourably than that of men. These findings suggest that the challenges linked to role sex typing and gender stereotypes experienced by women leaders in professions generally (see section 3.4.1.1), are compounded by engineering masculinities.

3.5.6 Summary

This section has examined the literature relating to the transition to management and leadership in the engineering profession. Firstly, the conceptualisations of the move from engineering to management roles were explored. Much published research considers transition from engineer to manager as a distinct change of roles that is experienced as a dilemma for individuals and organisations. This was followed by a review of literature focusing on the challenges experienced by engineers who have made the move to manager. In view of these challenges, the motivations for engineers to make this career move were discussed. The next section focused on a study by Seethamraju (1997) that moved beyond challenges and motives to explore the factors that influence engineers’ transition to management in the Australian context. Finally, the emerging literature on engineering leadership was reviewed.

The primary contribution of this study to knowledge relating to transition to management and leadership in the engineering profession will be to introduce the perspective of women engineers, which is absent from the existing understanding of engineering management and leadership.

Much of the knowledge about the engineer-manager transition is based on analyses conducted in the 1980s and 1990s and the experiences of the very small number of women engineers at that time were not considered. Women’s experiences and perspectives are also absent from more recent work that

examines the challenges, motivations and influences associated with becoming a manager in the engineering profession. Thus, this study will extend the understanding of the engineer-manager transition to include women engineers' experiences in the context of contemporary engineering careers.

As highlighted by Rottman et al (2015), there has been a heavy focus on engineers and management, as opposed to leadership. So, a further contribution of this study is to add to the emerging literature on engineering leadership. Specifically, it will consider the conceptualisation of engineering leadership from the perspective of women engineers. It will also provide an understanding of their experience of becoming a leader that has not been explored in the engineering leadership literature.

3.6 Chapter Summary

This chapter has critically reviewed the academic literature relating to women engineers' advancement to management and leadership roles in Australia. The purpose of the review was to establish the research areas of relevance to this study, and to provide a foundation for the current research.

Three areas of literature were considered. Firstly, academic research centred on women engineers working in industry was reviewed. The effect of the highly masculine culture on women engineers' experiences at work, and the range of strategies that women engineers use to negotiate the resulting challenges and difficulties were highlighted. Emerging research exploring women's persistence in engineering work, professional identity, and sense of belonging in engineering were considered. The review revealed that little is known about women engineers in senior roles and their experiences of advancement.

Given this lack of understanding, the chapter then moved to consider academic research relating to women's progression to management and leadership roles. Women's progression to management and leadership can be informed by two areas of research that have been largely separate – women's managerial advancement and managerial and leadership transition. Consideration of the literature in these areas revealed that there is understanding of factors that

influence women's entry and progression within managerial and leadership roles, but women's perspectives of becoming a manager and leader within a gendered context have not been considered. Inclusion of women's perspectives of becoming a manager and leader within a gendered context can build on the current understanding afforded by identification and analysis of predictive factors, and advancement to management and leadership through a gender-neutral lens.

The final section of this chapter considered research relating to becoming a manager and leader in the engineering profession. The move from engineering to management roles, including the current understanding of the challenges, motivations and influencing factors were reviewed. Finally, the emerging literature on engineering leadership was considered. This section reinforced the absence of women's experiences and perspectives from both the understanding of management and leadership in engineering, and the experience of becoming a manager and leader within the profession.

This chapter showed that very little is known about women managers and leaders in engineering and their experiences of advancement to these senior positions. Aspects of their experiences can be informed by previous research relating to women in engineering, women in management and leadership, and management and leadership transition generally and within the engineering profession. Thus, this research is positioned at the centre of these areas of scholarship with the view to extending the understanding of women's experiences of becoming managers and leaders, in a specific, highly gendered professional context that is not present in the literature.

The next chapter addresses methodological considerations. The research question and objectives that are central to the project are presented. The development and implementation of the enquiry framework and methods of the research, informed by the aims of the project, are described.

4 Methodology

4.1 Introduction

The previous chapter critically reviewed the academic literature relevant to women engineers' advancement to management and leadership roles in Australia. This chapter establishes the enquiry framework used for this project. The philosophical stance and theoretical perspectives of the study are discussed, providing justification for the chosen research design.

The chapter begins with the research question and objectives that are central to the project. This is followed by an overview of the research approach. The development of the enquiry framework is described in more detail, and the connection between the research question and enquiry framework is established. The chapter concludes with a description of the procedural aspects of the research, and their implementation.

4.1.1 The Research Question and Research Objectives

The critical review of the literature relevant to women engineers' advancement to management and leadership roles in Australia presented in the previous chapter identified that very little is known about women engineers' career advancement and women engineers' experiences in senior roles. This research builds knowledge in these areas by exploring the experiences of women engineers who have made the transition to managers and leaders in their organisations.

The literature review indicated that becoming a manager in engineering was common, yet challenging for individuals and organisations. Historically, becoming a manager was conceptualised as leaving engineering; recent work questioned the clear division between engineering and management work and suggested that it was a continuous process. A lack of conceptual understanding regarding engineering leadership and what it is to be a leader in engineering was highlighted.

The perspectives and experiences of women engineers moving to management and leadership are largely invisible, however some research indicated that initiating and building managerial careers is particularly difficult for women engineers due to the gendered context of the profession and engineering workplaces. A further issue highlighted in management and leadership transition studies was identity development. This was cast as more problematic for women managers and leaders who may have difficulty in perceiving themselves as manager and leaders, and in being seen by others as such, in these roles.

Given the limited understanding of women engineers' career advancement and women engineers' experiences in senior roles, and the indication that their experiences are likely to differ from those forming current understanding, the research question driving the research process was:

"How do women engineers transition into managers and leaders in technical organisations?"

This question aimed to achieve the following objectives:

1. Understand the experience of transition to manager and leader for women engineers
2. Understand how management and leadership in technical organisations is conceptualised, from the perspective of women engineers
3. Uncover the factors that affect the transition to manager and leader for women engineers
4. Identify implications for policy and practice to advance women in engineering

Having established the guiding question and objectives, the next section provides an overview of the research approach.

4.1.2 Overview of the Research Approach

"Having established a set of research questions, the next task is to devise ways to answer them" (Blaikie, 2010, p. 80).

This research focused on women's lived experiences of their move into management and leadership and the ways in which they individually experience this transition. The research was positioned within the constructivist interpretive paradigm, which considers the social world to consist of multiple realities that are individually constructed and shaped by social and personal contexts.

From this position, the research assumed that each woman participating in the study would have a unique experience of her advancement to manager and leader, shaped by factors such as her previous experiences, personal ideologies and beliefs, culture and gender. This position considered the activities of uncovering and sense making to be collaborative and interpretive, recognising my role as researcher as a co-creator or co-participant with the interpretive process moderated by my own social and cultural influences.

The research approach was guided by two theoretical perspectives - phenomenology and feminism. These theoretical perspectives helped to formalise the viewpoint that I brought to the research. A phenomenological lens focused the research on a particular phenomenon - the movement into management and leadership roles - as experienced by the study participants and placed their accounts and stories at the centre. The intent of the research was to uncover and make sense of the multiple perspectives of this transition, and to capture the essence of the transition as experienced by the participants.

A feminist perspective acknowledged gender as a basic organising principle in society (Lather, 1991) and that the choices made and experiences relayed by the study participants were shaped by gendered social systems and organisations (Acker, 1990; Sinclair, 2014). Women engineers' experiences of becoming a manager and leader are not visible in the published literature. Through a feminist lens, this research intended to make women's experiences of transition visible, to claim them as legitimate knowledge and to use this knowledge to shape policy and practice to increase women engineers' participation in senior roles. Further, the research focused on the experience of women in non-traditional, male dominated workplaces, placing the participants' stories at centre and

acknowledging the diversity of their experiences (Harding, 1987a, 1987b, 1991; Oleson, 2011), complementing the phenomenological outlook.

Making visible the women's experiences required obtaining accounts of their experiences. A qualitative approach informed by hermeneutic phenomenology and feminist perspectives guided the research design. Semi-structure in depth interviews were employed to collect data. A flexible and interpretive analytic approach was taken, guided by the methodical activities outlined by Van Manen (1990) and Moustakas (1994).

4.2 Qualitative Research

Qualitative research is broad and evolving (Denzin & Lincoln, 2011). Differences in theoretical position, research strategy and technique, are unified by common features. These include research purpose, relationships to theory, research strategy or approach, data and findings, and research participants.

At the heart of qualitative research are problems or questions "inquiring into the meaning individuals or groups ascribe to a social or human problem" (Creswell, 2007, p. 37). Qualitative research attempts to make sense of situations by uncovering the meanings and interpretations that form the human experience (Denzin & Lincoln, 2011). In his discussion of research models that guide human science research, Moustakas (1994) identifies that qualitative methodologies search for "meanings and essences of experiences rather than measurements and explanations" (p. 21). Qualitative approaches are well equipped to "view the linkages between events and activities and to explore people's interpretations of the factors which produce such connections" and to gain insight into the processes of society (Bryman, 1988, p. 93). This view is echoed by Moustakas (1994) who describes qualitative research as "focusing on the wholeness of experience rather than solely on its objects or parts" (p. 21).

Bryman (1988) characterises qualitative methodologies as having an ideographic approach which "locates its findings in specific time periods and locales" (p. 91). The strength of an ideographic approach is that it gives voice to and reveals perspectives of specific groups within society that may have previously been

quiet, hidden or obscured. The importance of giving voice is emphasised by Cannella and Lincoln (2011, p. 83) who state that “voices from the margins demonstrate the range of knowledge, perspectives, languages, and ways of being that should become foundational of our actions, that should become a new centre”.

A common starting point for qualitative research is the individual experience collected within the natural setting or “at the site where participants’ experience the issue or problem under study” (Creswell, 2007, p. 37). The researcher’s stance can be described as that of an insider, viewing the world “as a participant in that setting” (Bryman, 1988, p. 96). Direct and sustained contact between the researcher and participants facilitates the development of close relationships (Bryman, 2004, 2016; Creswell, 2007; Creswell & Poth, 2017) allows the researcher to access rich and deep data.

Qualitative research applies an inductive logic to achieve its aims. Creswell (2007, p. 19) describes this as “from the ground up, rather than handed down entirely from a theory or from the perspectives of the inquirer”. Theory is used as a lens or perspective, rather than a prescriptive and predetermined starting point of research, and the development, building or modification of theory characterises a qualitative approach. The qualitative approach is emerging and flexible. The researcher can shape their research design as the research process unfolds and adapt to the experience of collecting and analysing data (Bryman, 2004, 2016; Creswell, 2007; Creswell & Poth, 2017). Data analysis with focus on the participant’s views of the issue allows themes and abstractions to emerge from the data, rather than being identified beforehand by the researcher (Schwandt, 2003).

Creswell (2007, pp. 39-40) writes “we conduct qualitative research because a problem or issue needs to be explored. This is needed, in turn, because of a need to study a group or population, identify variables that can be measured, or hear silenced voices”. For this research, a qualitative approach was appropriate as the research question and objectives asked for exploration of the experiences of women engineers’ transition to manager and leader. This transition was not well

understood and had not previously been given voice. Further, the research was concerned with establishing a detailed picture of this experience, from the viewpoint of those that have experienced the change rather than setting out to test a pre-determined hypothesis (Bryman, 1988; Carter & Little, 2007).

In the choice to undertake a qualitative study, certain philosophical and theoretical assumptions were made. These assumptions formed the enquiry framework that shaped the way in which the research was performed. The decisions made in establishing the enquiry framework are detailed in the following section.

4.3 Establishing an Enquiry Framework

“The gendered, multi-culturally situated researcher approaches the world with a set of ideas, a framework (theory, ontology) that specifies a set of questions (epistemology), which are then examined (methodology, analysis) in specific ways” (Denzin & Lincoln, 2011, p. 11).

As indicated by the quote above, Denzin and Lincoln (2011) outline a series of philosophical principles that guide the inquirer and the research. These principles include ontology, which concerns the nature of reality, and epistemology, which considers the nature of knowledge and the relationship between the inquirer and the known. The ontological and epistemological stances inform the research methodology, a further philosophical position that considers how knowledge is gained and relates to the processes of research.

Carter and Little (2007) include the epistemology and methodology philosophies, together with the more procedural pillar of ‘method’, in their three fundamental facets of research, while Blaikie (2010) argues that logics of enquiry are underpinned by ontological and epistemological assumptions and have connections with certain philosophical traditions. In addition to philosophic choices, researchers may draw on theoretical perspectives. These perspectives or positions provide an interpretive lens for the research project (Creswell, 2007; Creswell & Poth, 2017).

The philosophical and theoretical positions adopted by the researcher form the research paradigm, or the set of beliefs that inform the practice of research (Creswell, 2007; Denzin & Lincoln, 2011). Assumptions are brought to research both by established research approaches, theoretical perspectives and by the worldview, or inherent preferences, of the researcher (Creswell, 2007; Creswell & Poth, 2017).

Carter and Little (2007) remark that the fundamental facets of research “provide the framework for planning, implementing and evaluating the quality of qualitative research” (p. 1316). Further, Blaikie (2010) emphasises the importance of aligning philosophic assumptions with the original research problem and the questions that drive the inquiry.

This section establishes the paradigm, philosophical assumptions and theoretical perspectives that oriented this research study. Figure 4.1 illustrates the connections between the aspects of the research framework:

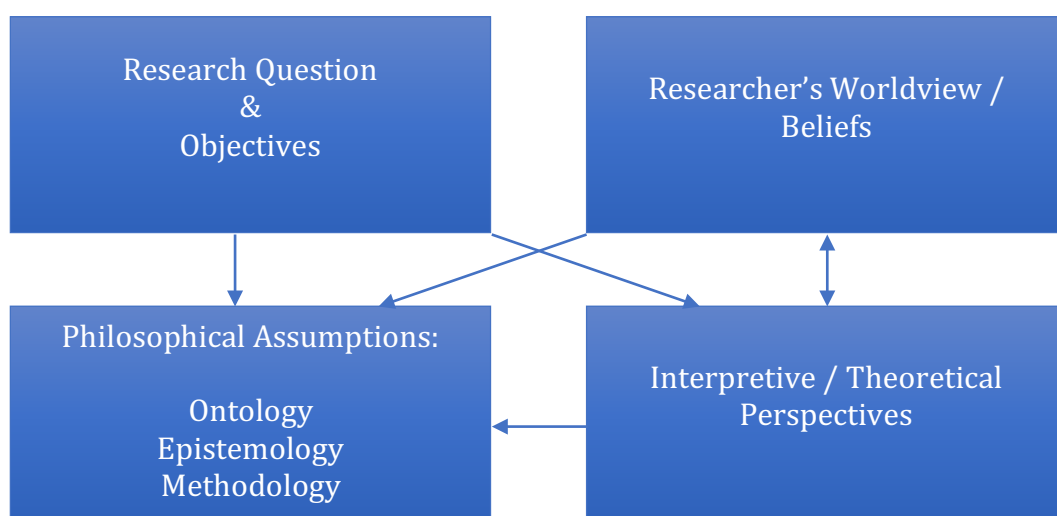


Figure 4.1 – Aspects of the Research Framework

It is common to open the discussion of the theoretical dimensions of research design with ontological and epistemological matters. However, I have chosen to begin with an overview of the theoretical perspectives that informed the research design because as Blaikie (2010) explains, a theoretical perspective provides a lens for examining the social world. Further, they may “include ontological and

epistemological assumptions and associated practices for the pursuit of social knowledge” (ibid p. 126).

In this research, the theoretical perspectives of phenomenology and feminism helped to formalise the viewpoint that I brought to the research; and had implications for the choice of research paradigm and philosophical assumptions made.

4.3.1 A Phenomenological Perspective

“We enter the phenomenon to discover what is meaningful from the viewpoints and actions of people who experience it. We cannot assume that we already know what is meaningful” (Charmaz, 2004, p. 981).

Phenomenology is a philosophic system and practice, which at its core attempts “to describe phenomena, in the broadest sense as whatever appears in the manner in which it appears, that it manifests itself to consciousness, to the experiencer” (Moran, 2000, p. 4). Research informed by phenomenology questions the way in which people experience the world, and aims to enhance “understanding of what humans actually experience in their situations and lives” (Rehorick & Bentz, 2008, p. xv).

The phenomenological movement originates in the late 19th century from the writings of Edmund Husserl. Moran (2000) notes that Husserl saw himself as establishing a new discipline or philosophical current that was concerned with the discovery of meanings and essences in knowledge. Husserl’s transcendental or descriptive phenomenology was subsequently developed on by other philosophers, including Heidegger and Merleau-Ponty, each establishing varied and deviating traditions upon the philosophical foundations of phenomenology. (See Moran (2000) and Dowling and Cooney (2012) for detailed reviews of the development of phenomenology as a philosophy).

Though variety and complexity exist in phenomenological traditions, different approaches have common characteristics. Drawing on the work of Van Manen

(1990), Creswell (2007), Moustakas (1994), Moran (2000) and Rehorick and Bentz (2008) the underpinnings of phenomenology include:

- A focus on **lived experience**: research guided by this perspective aims to understand the nature and meaning of everyday experiences of people.
- Situated within the **“Life World”**: research begins in world of lived experience, which is the “world of the attitude of everyday life” (Van Manen, 1990, pp. 7, 53).
- A philosophy **without presupposition**: this approach suspends all judgements about what is real, adopting what Husserl termed “the natural attitude” and focusing the research on the experiences of the participants, rather than researcher interpretations (Moustakas, 1994).
- The principle of **intentionality**: consciousness relates to being “conscious of something” (Langdridge, 2008, p. 1127).
- Descriptions of **experiential meanings**: the key to phenomenological research is the description and interpretation of lived meanings. “Experiences and lifeworlds do have forms and meanings that provide the nuts and bolts of our everyday lives” (Rehorick & Bentz, 2008, p. 7).
- The study of **essences**: research guided by phenomenology attempts to uncover and describe the structures of lived experience. Phenomenology seeks to know “that which makes something what it is, without which it could not be what it is” (Van Manen, 1990, p. 9).

These underpinnings have implications for ontological and epistemological assumptions made in research.

At the core of phenomenology is the individual experience, created by the interaction between a person’s consciousness and the world. The world or ‘lifeworld’ is conceptualised as integral with, rather than separate from the people experiencing it. Further, phenomenology recognises that “all experience must be understood in the context of the person having the experience and the way that they see the world” (Langdridge, 2008, p. 1128). Thus, in research informed by phenomenological philosophy, the nature of reality, or ontology, is

viewed as subjective, contextual and diverse. This is expressed as the existence of ‘multiple realities’ by some researchers (Creswell, 2007).

Some tensions exist in relation to epistemological concerns in phenomenological research. As noted earlier, epistemology relates to questions of knowledge: what constitutes knowledge, how knowledge is produced, and the relationship between the inquirer and what is known. While phenomenological research positions participants’ consciousness and experiences as the source of knowledge, various traditions hold differing views on how knowledge is produced from these experiences. Particular points of difference include the role of ‘description’ versus ‘interpretation’ of the experiences of a phenomenon, and the im/possibility of the existence of a pre-suppositionless state (Finlay, 2008, 2009b). A pre-suppositionless state involves coming to research without bias, extant ways of perceiving and knowing, or analytic position (Denzin, Lincoln, Gubrium, Holstein, & Mills, 2004; Moustakas, 1994).

Phenomenologists inspired by Husserl adopt a “strictly descriptive approach” (Giorgi, 1985) focusing on the portrayal of an experience and aiming to “reveal essential general meaning structures of a phenomenon” (Finlay, 2009b, p. 10). In contrast, Heidegger and fellow hermeneutic philosophers, argue that knowledge is created through the interpretation of other’s experiences, and that “all description involves interpretation” (Moran, 2000, p. 20). Further, they believe that it is impossible to achieve a perfect state of pre-suppositionlessness. thus interpretation is coloured by an inquirer’s expectations, experiences and prior understandings of the matter. In practice, many researchers view a description and interpretation as a continuum (Finlay, 2009b; Langdridge, 2008; Van Manen, 1990; Wertz, 2005).

4.3.2 A Feminist Perspective

Feminist theory is a complex body of theoretical perspectives that have emerged from and continue to develop within varied historical, political and social contexts (Calás & Smircich, 2009; Oleson, 2011). Feminist perspectives provide a means for exploring, understanding and ultimately transforming gendered social

systems and circumstances that create and maintain women's inequality and oppression (Chafetz, 2006; Maynard, 2004). These social systems are seen as generated by men, and designed to privilege their perspectives and experiences (Acker, 1990, 1992; Walby, 1989)

Gender is at the heart of feminist research, and though the strands of feminist theory differ in their ontological view of gender, contemporary feminist theory "understands gender as a central axis around which social life revolves; it is an axis of inequality/domination-subordination, where gender relations are hierarchical power relations" (Calás & Smircich, 2009, p. 247).

According to Oleson (2011), an important and dominant discourse in feminist research concerns epistemological claims: "Whose knowledges? Where and how obtained, by whom, from whom, and for what purposes?" (ibid p. 129). These questions have stimulated developments in feminist theory that have methodological implications. One relates to the objectivity of research; a second is the concept of epistemic privilege (Hesse-Biber, 2014b).

Feminist researchers argue that traditional emphasis on achieving objectivity in research, by way of increasing generalisation, neutrality and abstraction, and the discounting of context and social location, produces knowledge that bears "little resemblance to the phenomenon under examination" (Naples & Gurr, 2014, p. 19). Harding (1991) championed the concept of strong objectivity which acknowledges the contributions of political, social and historic aspects of knowledge and knowledge production.

The feminist epistemological position emphasises the importance of context, deeming all knowledge to be 'situated' and arising from the particular historical and social positions of the knower (Haraway, 1988; Harding, 1987a). This view complements the phenomenological view of 'multiple perspectives', acknowledging the diversity of experiences, identities and subjectivities "among women and within the same groups of women" (Oleson, 2011, p. 130).

Another key argument for feminist researchers is that conventional research privileges man as knower (Harding, 1987b) "authorising as knowledge only

certain views of the world” (Calás & Smircich, 2009, p. 250) and thus representing a narrow field of experience. Feminist research challenges this epistemological stance, shifting away from the male viewpoint to claim women’s experiences as legitimate knowledge (Harding, 1987a). Linked to the arguments on objectivity, “more objective and more relevant knowledge is produced by starting inquiry from the lived experiences of women” (Naples & Gurr, 2014, p. 21).

Feminist research is distinguished by both its emphasis and purpose. Harding (1987b) argues that feminist research is not simply research about women. Instead, it must be research *for* women and towards their interests. Problems for research stem from women’s experiences, rather than the male viewpoint. Research “centres on and makes problematic women’s diverse situations and the institutions that frame those situations” (Creswell, 2007, p. 25), and questions “the apparent naturalness and inevitability in the status quo” (Calás & Smircich, 2009, p. 2). A further feature is an agenda for change and transformation. Feminist research is born from women’s experiences in political struggles (Harding, 1987b) and is characterised by a social justice agenda (Oleson, 2011). It intends to make visible women’s experiences and end women’s unequal position in society (Hesse-Biber, 2014b; Lather, 1991).

Feminist theory also comments on the role of the researcher in the production of knowledge from women’s experiences. In contrast to Hursell’s transcendental phenomenology, which emphasises the influence of the researchers ‘life world’ on the research process and attempts to isolate this, feminist theory considers the generation of knowledge to be a shared process and places the researcher within the research “visible as a real, concrete, historical individual with interests and desires” (Calás & Smircich, 2009, p. 249). A collaborative and non-exploitative relationship between the researcher and participant is considered vital. Researchers are urged to be reflexive and to acknowledge the impact of power relations between the researcher and researched on the interpretive process (Calás & Smircich, 2009; Creswell, 2007).

4.3.3 Research Paradigm and Philosophical Assumptions

There are many well-established paradigms that act as a framework for research, providing a source of theoretical ideas and ontological and epistemological assumptions (Blaikie, 2010). Creswell (2007) identifies the four paradigms of post-positivism, constructivism, advocacy/participatory and pragmatism, while Denzin and Lincoln (2011) describe a range of general interpretive paradigms including positivist, post-positivist, constructivist/interpretive, critical and participatory positions. Research paradigms are an ongoing area of debate within research communities and continue to evolve over time (Blaikie, 2010; Creswell, 2007; Creswell & Poth, 2017).

Reflection upon the research question and objectives that emerged from a review of relevant literature, and upon phenomenological and feminist perspectives placed this research in the constructivist/interpretive paradigm. Research framed by this paradigm seeks to develop understanding of an individual's world, by interpreting the individuals' perceptions of experiences (Lincoln, Lynham, & Guba, 2011). Constructivist research intends to uncover the varied and multiple meanings held by others, relying heavily on the participant's views of the research matter (Creswell, 2007; Creswell & Poth, 2017).

Within the research paradigm sit philosophical assumptions that inform the research design. The ontological position makes clear the researcher's beliefs about the nature of reality, being and existence – that is “what kinds of things do or can exist, the conditions of their existence, and the ways in which they are related” (Blaikie, 2007, p. 13).

Linked to ontology, epistemology forms the foundation for all philosophical thinking. Epistemology is concerned with knowledge and the most appropriate ways of inquiring into the world, asking “what is knowledge?” and “how is knowledge made known?” (Carter & Little, 2007; Easterby-Smith, Thorpe, & Jackson, 2012; Symon & Cassell, 1998). In the context of organisational enquiry, Hatch (1997) describes epistemology as the philosophy of understanding how we can know the world. Creswell (2007) examines epistemology through the

question “What is the relationship between the researcher and that being researched?” highlighting the role of the researcher in knowledge creation.

The third pillar of the philosophical foundation of this research is methodology. The methodological stance is influenced by ontological and epistemological views, and is revealed in by the responses to the questions “How do we gain knowledge of the world?” or “what is the process of research?” (Creswell, 2007; Creswell & Poth, 2017; Denzin & Lincoln, 2011). Carter and Little (2007) emphasise the distinction between methodology and methods, noting that methods relate to the techniques used to gather evidence to investigate the research question, and methodology is the description and justification of those methods.

4.3.3.1 Ontological and Epistemological Position

Denzin and Lincoln (2011) associate a relativist ontological stance with the constructivist/interpretive paradigm. Guba (1990) describes relativism, in which “realities exist in the form of multiple mental constructions, socially and experientially based, local and specific, dependent for their form and content on the persons who hold them” (ibid p. 27). Blaikie’s ‘Idealist’ ontology, corresponding to Guba’s relativism, considers that “the external world consists of representations that are creations of individual minds” (Blaikie, 2007, p. 16). That is, the social world is mind-dependent and is the product of the many and differing interpretations and perceptions of individuals that are informed and reformed by their personal experiences, memories and expectations (Flowers, 2009; Hatch, 1997).

The intent of this research was to reveal and make sense of multiple, contextually influenced realities (Creswell, 2007; Creswell & Poth, 2017), specifically the participants’ experiences of becoming a manager and leader in their organisations. The ontological stance taken considered that each woman participating in the study has a unique experience of her advancement to manager and leader. Her ‘reality’ or perception of that experience was shaped by factors such as previous experiences, personal ideologies and beliefs, culture and

gender. That is: her personal reality is individually constructed, and is subjective rather than objective (Morgan & Smircich, 1980).

In their discussion of philosophical assumptions, Lincoln et al. (2011) link a transactional/subjective epistemology to their relativist ontology. From this position, the research participants' multiple mental constructions that constitute social reality form a foundation for knowledge. Knowledge is subjective; it is dependent on the knower and shaped by the cognitive, social and cultural factors that influence the knower (Hatch, 1997). Knowledge creation is also transactional and interpretive; it is co-created through interactions between the researcher and the researched, and the interpretation of what is found and then re-presented by the researcher (Lincoln et al., 2011).

Blaikie (2010) makes a similar argument in his discussion of constructionist epistemology. He highlights the interpretive nature of knowledge and the researcher's role in knowledge creation: "everyday knowledge is the outcome of people having to make sense of their encounters with the physical world and other people, and social scientific knowledge is the outcome of social scientists reinterpreting this everyday knowledge into technical language" (ibid p. 95).

The epistemological position taken for this research draws on these arguments and is tempered by the ontological and epistemological concerns of phenomenology and feminist theory discussed in sections 4.3.1 and 4.3.2. This research focuses on women's lived experiences of their move into management and leadership and the way that they each experience role transition and career advancement. Following Blaikie, the women's consciousness and experiences of their transition from engineer to manager and leader constitute 'everyday knowledge' and are a legitimate source of social science knowledge. The literature review presented in Chapter 3 revealed that women's experiences of this phenomenon are not visible in the published literature, thus in line with feminist epistemological views, the intent of this research is to make women's experiences of transition visible and to claim them as legitimate knowledge.

In line with the subjective stance, the research views women's experiences of transition from engineer to manager and leader as unique and shaped by their diverse cognitive, social and cultural influences (Scott, 1991). Through a feminist lens, this knowledge is situated within and impacted by gendered social systems and organisations (Harding, 1991), where gender is a social contract that is unique for each individual (Stewart, 1994).

Understanding women engineer's transition experiences is both a collaborative and interpretive process. Making visible women's experiences requires obtaining accounts of their experience. Further, the transactional stance taken emphasises my role as researcher in co-creation of knowledge through the interpretation of these accounts. As with the women's own experiences, the interpretive process is moderated by my own social and cultural influences. My knowledge of the engineering profession, my experiences as a woman engineer, as an engineer and manager within engineering organisations in the global oil and gas industry, and of working with Women in Engineering committees contribute a unique perspective to this research.

Finally, the feminist perspective influences the purpose of the research. It asks for research to be for women and towards their interest. In this way, this research asks what we can learn from women who have made the transition and how this can be used to assist others making this move.

4.3.3.2 Methodological Considerations

Methodological philosophy asks "how do we gain knowledge of the world?" given our assumptions of the nature of reality and knowledge. Lincoln et al. (2011) describe methodologies within the interpretive paradigm as hermeneutic, dialectic and naturalistic. The process of gaining knowledge is interpretive and involves comparison and contrast of multiple perspectives collected through naturalistic methods such as interviewing and observation. Blaikie (2010) suggests the adoption of an abductive research strategy when addressing "the meanings and interpretations, the motives and intentions, that people use in their everyday lives and which direct their behaviour" (ibid p. 89). An abductive

approach focuses on understanding the 'insider' view of the social world and developing knowledge by describing and interpreting the "lay descriptions of social life, to technical descriptions of social life" (ibid p. 90).

This research called for exploration of a specific career experience and the uncovering of the perspective of those that have had this experience along their career journey. It was concerned with establishing an understanding of the women engineers' experiences of becoming a manager/leader, from the viewpoint of those that have experienced this. Based on the research commitments made thus far, an appropriate research methodology would:

- Acknowledge the existence of multiple perspectives.
- Accommodate the examination of a phenomenon that is not well understood or represented in existing literature.
- Allow exploration of women's interpretations of their experiences.
- Recognise joint production of knowledge by the participants and the researcher.

The research design for this project was influenced by an interpretive methodology guided by hermeneutical phenomenology. As discussed in section 4.3.1, hermeneutic phenomenology views the understanding of lived experience as an interpretive process, rather than purely descriptive.

This qualitative, phenomenological approach contrasts with approaches in much of the literature on women engineers (Mills et al., 2008; Roberts & Ayre, 2002; Schwandt, 2003), women's career transitions (Cabrera, 2007; Mattei & Jennings, 2008), women in management and leadership roles (Still et al., 1994; Tharenou et al., 1994; Eagly & Johannesen-Schmidt, 2001; Tharenou, 2001) and engineering leadership and management (Wearne, 2004) in which quantitative methodologies have been employed.

Qualitative approaches have been used, often in combination with quantitative surveys. McIlwee & Robinson (1992) conducted a mixed method study of Californian women engineers exploring experiences and attitudes to engineering studies, entry into the profession and practice as an engineer. Miller (2004)

explores the experience of women engineers in the Canadian oil industry using an interpretive ethnographic approach. A recent body of work surrounding Australian women, education and engineering uses interview based approaches (Gill et al., 2005; Mills et al., 2006) and mixed methodologies (Gill et al., 2008) to establish a picture of the life of engineering women. The use of an interpretive, phenomenologically based methodology to examine the experience of female engineers placed the priority firmly on the stories of the study participants and allowed the rich description of a specific career event.

The next section describes the design and implementation of the main stages of research. The research design was shaped by theoretical assumptions made in establishing the enquiry framework. The implications of these choices on conducting the research are discussed.

4.4 Research Design and Implementation

Following the development of the enquiry framework, the procedural aspects or methods of the research were established. Carter and Little (2007) define research methods as the “practical activities of research: sampling, data collection, data management, data analysis and reporting” (p. 1318). Drawing on qualitative research processes and techniques of Denzin and Lincoln (2011) and Johnston (2001), and phenomenological methods of Moustakas (1994) and Van Manen (1990), the main stages of the research were:

- Formulating the research question
- Preparation for gathering data
- Data collection
- Data analysis
- Synthesis of findings and writing of the thesis

Each of these stages are described in more detail in the following sections.

Charmaz (2004) states that “methods are merely tools... Methods should offer reasons and route, but not recipes” (p. 987). Further, according to Van Manen (1990, p. 162), “a certain openness is required in human science research that

allows for choosing directions and exploring techniques, procedures and sources that are not always foreseeable at the outset of a research project”.

This section provides an account of the approach taken to conduct this research into women engineers’ experience of the transition to manager and leader. It defines the stages of research and documents my experience of implementation, noting the directions taken and deviations from the original design.

4.4.1 Formulating the Research Question

As outlined in the introductory chapter of this thesis, this study was instigated by an apparent paradox between the prevailing discourse on women’s attrition from the engineering profession and my own exposure to highly successful women engineers who occupied positions of management and leadership. The initial stage of this research project involved transforming this personal interest and curiosity about women who had advanced to positions of influence in their engineering careers, to a specific research question and problem that defined the scope of the study. According to Booth, Colomb, and Williams (2008): “if a writer asks no specific question worth asking, he can offer no specific answer worth supporting” (p. 41).

To articulate the research question, a broader understanding of the research context was required. This review presented in Chapter 2 revealed that women are engaged in ‘non-traditional’ occupations such as engineering in low and static proportions. Statistical and workforce based surveys indicate attrition issues centred around workplace culture. Further, investigations and initiatives to increase women’s participation have focused on retention, with little specific focus on women’s advancement in engineering.

The research problem is placed at the point of intersection of gender, the engineering profession and advancement to management and leadership. As such, a critical review of relevant academic literature was performed. The review presented in Chapter 3 focused on three specific areas relating to women’s advancement in the engineering profession: women in the engineering profession, women’s progression to management and leadership roles, and

management and leadership in the engineering profession. The literature review supported the conclusions of the contextual study, revealing that very little is known about women engineers who progress to positions of influence within organisations, and limited attention to the individual *experience* of becoming a manager and leader.

Shaping the research question was an iterative, multi-directional process, influenced by and supporting the choice of qualitative methodology, and feminist and phenomenological perspectives. Given the absence of published work on women's advancement in engineering, an exploratory research question was appropriate. Feminist and phenomenological influences reinforced the focus on uncovering and understanding women's experiences at the individual level.

The research question provides the connection between "what it is that you wish to research with how you are going to go about researching it" (Mason, 2002, pp. 19-20). The following sections detail the steps taken to answer the research question.

4.4.2 Preparation for Gathering Data

Prior to collecting data for a study, some preliminary activities were conducted. These included selecting an appropriate data collection technique, preparing instruments for data collection, and reflexive acts aligned with the research's theoretical framework.

4.4.2.1 Reflexive Acts

"One approach to making ourselves more accountable and thereby sharing our experiences and insights more fully with readers, is to locate inquiry within the process and context of actual human experience" (Altheide & Johnson, 2011, p. 592)

Reflexivity, or the act of self-awareness and self-scrutiny by a researcher of their role in the research process, is a key feature throughout the research process of qualitative research (Mason, 2002). For researchers undertaking

phenomenologically oriented inquiry, reflexivity at the start of the research process takes the form of “making explicit our understandings, beliefs, biases and assumptions, presuppositions and theories” (Van Manen, 1990, p. 47).

Transcendental phenomenologists aspire to a state of epoche, described by Moustakas (1994) as an inclination towards receptiveness, and being “more readily able to meet something of someone and to listen and hear whatever is being presented, without colouring the other’s communication with my own habits of thinking, feeling, and seeing, removing the usual ways of labelling or judging, or comparing”. (ibid p. 89). Giorgi (1994) describes an “attitude of relative openness” (p. 212). As part of research preparations, preconceptions regarding the phenomenon being studied are set aside through bracketing, or the process of Epoche (Moustakas, 1994). The goal of this process is to reach a pre-suppositionless state in which the actual nature and essence of things is revealed.

For Moustakas, a pre-suppositionless state is achieved through the following reflective steps:

- focusing on the particular situation and finding a quiet place to review current thought and feelings regarding the situation;
- setting aside biases and prejudgements and having the intention of seeing the situation, issue with new and receptive eyes;
- a reflective-meditation, in which preconceptions and prejudgements enter consciousness and leave freely. During the process, prejudgements are labelled and written out; and
- reviewing this list of preconceptions, until a feeling of readiness and openness to encounter the situation or issue is felt.

Debate in the phenomenological literature regarding the necessity in engaging in the process of bracketing, and the scope of the process, is highlighted by Finlay (2009b) and Tufford and Newman (2012). While some phenomenologists such as Moustakas encourage the pursuit of a non-influential and neutral stance in which past understandings, experiences and assumptions are bracketed, others including Van Manen question the desirability of setting aside the personal

experience and understandings of the researcher. From this position, awareness of pre-existing beliefs and the impact on these beliefs on research process are encouraged (Finlay, 2009b).

In feminist research, Harding (1991) makes a case for strong objectivity, recognising that a researcher's "cultural beliefs and behaviours shape the results of their analysis" (Maynard, 2004, p. 14) and thus help to create the knowledge which is produced. Rather than suppressing the researcher's subjectivities, feminist research advocates for making the researcher visible and acknowledges that data is mutually created by the researcher and the participant.

Maynard suggests several forms of reflexivity available to researchers throughout the research process including: i) critical awareness of the researcher's life context, ii) making explicit the grounds for conducting the research, iii) reflection upon a researcher's class, race, gender and other experiences and the likely effect on the research, and iv) reflection upon emotional reactions to the research situation. Langdrige (2008) notes that techniques such as adopting a reflexive approach to research facilitate awareness of the influence of the researcher on knowledge generation.

In order to balance the apparent tension between phenomenological reduction and feminist views, I drew on Van Manen's practice of making explicit assumptions, Finlay's relational phenomenology (Finlay, 2009a) and feminist reflexive practices. Rather than engage in suspension or bracketing of my understandings of what it was for a woman engineer to become a manager and leader, I acknowledged that I would have pre-existing beliefs regarding the phenomenon derived from i) my experience as a woman engineer, and as a woman engineer who had transitioned to a management role within a technical organisation, and ii) through my deep involvement in the women in engineering activities that exposed me to several women who had experienced this role transition.

I was guided by Van Manen (1990) to write a reflective account of my own experience:

“To conduct a personal description of a lived experience, I try to describe my experience as much as possible in experiential terms, focusing on a particular situation or event. I try to give a direct description of my experience as it is, without offering causal explanations or interpretive generalizations of my experience (ibid p. 54).

This enabled me to acknowledge this as a unique occurrence that influenced my worldview, and to realise and to state clearly that others will have experiences that are different and unique to them. Using this technique to gain awareness of my own assumptions before interviewing the research participants enabled me to approach data collection aware of my personal biases and enabled me to be ready to look upon the experiences of others with fresh eyes. A sample of my account is included in Appendix A.

4.4.2.2 Selection of Data Collection Method

In qualitative research, common methods for gathering data include interviewing, participant observation, use of documents or records and field research (Johnston, 2001; Van Manen, 1990). Use of interview data is very common in qualitative research, as it allows the researcher to “access areas of reality that would otherwise remain inaccessible such as people’s subjective experiences and attitudes” (Perakyla & Ruusuvuori, 2011, p. 529).

Collecting data through interviews aligns with both phenomenological and feminist approaches to research. Phenomenological research emphasises gathering the lived experience of others “in order to better be able to come to an understanding of the deeper meaning or significance of an aspect of human experience, in the context of the whole human experience” (Van Manen, 1990, p. 62). In line with feminist epistemology previously discussed, interviews allow for the exploration of the diversity of women’s experiences and the meanings that they attach to those experiences (Hesse-Biber, 2014a; Wambui, 2013). While a feminist approach to research does not prescribe a certain method (Harding, 1987b), it does inform the way in which interviews are designed and conducted. This is further addressed in section 4.4.3.

To understand how women engineers transition to senior roles, input from those that have experienced this phenomenon is required. Interviewing was deemed an appropriate approach to data collection for this study as it elicits input from the participants, allowing access to their subjective experiences.

4.4.2.3 Qualitative Research Interviews – Approach

The specific purpose of a research interview is to obtain “research-relevant information” (Chadwick, Bahr, & Albrecht, 1984, p. 103) and this is typically in the form of interpretations of experience or perspective from respondents. The phenomenological approach and feminist perspective that shape this research raise some considerations for the design and conduct of research interviews.

Van Manen (1990) explains that in phenomenological research, the interview serves very specific purposes. It is:

- “a means for exploring and gathering experiential narrative material that may serve as a resource for developing a richer and deeper understanding of a human phenomenon” (ibid p. 66).
- “a vehicle to develop a conversational relation with an interviewee about the meaning of an experience” (ibid p.66).

Further, Moustakas (1994) notes “the phenomenological interview involves an informal, interactive process and utilizes open-ended comments and questions” (p. 114). The hallmark of qualitative interviewing is a conversation, initiated by the researcher, with an emphasis on the researcher asking questions and listening, and respondents answering. For many qualitative researchers the interview is an interactional experience in which the researcher attempts “understand the meaning of respondent’s experiences and life worlds” (Warren, 2001, p. 83).

The importance of the interactional nature of interviewing within feminist research is highlighted by Oakley (1981) in her critique of predominant interviewing conventions, which she viewed as situated in a masculine paradigm and problematic for feminist research. Drawing on her experience of conducting

research on motherhood, Oakley challenged several characteristics of interviewing centred on objectivity and the depersonalisation of interviewer and interviewee, including:

- interviewing as a one-way process in which ‘interviewees’ do not ask questions back,
- objectification and subordination of respondents as data sources,
- correct interview behaviour that:
 - carefully balances ‘rapport’ and detachment to elicit data from respondents, and
 - avoids display of interviewer opinion for fear of generating bias; and
- interviews as rational transactions, devoid of personal involvement or impact.

Instead, Oakley found that she was both morally and practically compelled to redress the interviewer-interviewee relationship and adopt a non-hierarchical, reciprocal and personally involved approach interviewing her participants.

Supporting Oakley’s experiences, Reinharz and Chase (2001) highlight some methodological considerations relating to women interviewing women. Firstly, that interviews are not an isolated, inconsequential event, but may affect both interviewee and interviewer. For interviewees, this impact stems from the systemic silencing of women. The opportunity to disclose experience and to be listened to may be a unique experience. Relevant to this research, the authors note that while “powerful women are much more likely to be accustomed to speaking and being heard” (ibid p. 226) that “even well-educated women in managerial and professional occupations are not immune from self-censoring or silencing” (ibid p. 225).

A second consideration, relating to the ‘correct interview behaviour’ and the conventional relationship between interview participants highlighted by Oakley, is the role of interviewer self-disclosure. The sharing of ideas and personal experiences related to the research by the interviewer may act to “humanize and equalise the research relationship” (Reinharz & Chase, 2001, p. 227) and encourage respondent participation. Further, a connection and friendship that

may develop between women involved in feminist research. Oakley argued this as an obligation; in contrast Reinharz and Chase emphasise that the role of the researcher is to draw-out and listen to participants' experiences and that friendship bonds, while serendipitous, are not indicative of successful feminist research.

4.4.2.4 Qualitative Interviews - Structure and Depth

Qualitative interviews vary in the degree to which they are structured and the depth to which information is pursued. An interview may be highly structured with a strict interview protocol or it may be an unstructured, exploratory interview. Chadwick et al. (1984) indicate that a more structured interview is useful if the researcher has a large amount of information about a subject, or for obtaining the same information from multiple participants. The rigidity of a structured interview does not allow for exploration of issues beyond the original protocol - for example, issues or areas that may be important to the interview respondents that were unknown to the interviewer.

An unstructured format is better suited for exploratory studies and for obtaining information on detailed and complex issues. However, the lack of structure in this type of interview can be a limitation, as this more organic approach may fail to capture the information needed to form an answer to the research question or fulfil the research objectives. Amid this continuum are interviews that ask specific questions, but in an open-ended format, and interviews that cover specific topics but the "exact manner in which the questions are asked and their sequence are determined in the course of the interview" (Chadwick et al., 1984, p. 104).

In the phenomenological tradition, Van Manen (1990) emphasises the importance of the interview process being "disciplined by the fundamental question that prompted the need for the interview in the first place" that is: the research question. The literature review presented in Chapter 3 revealed that little is known about women engineers who progress to senior roles and of their experiences of advancement to managerial and leadership positions. Thus, an

exploratory and inductive approach was appropriate to answer the research question that emerged from the review.

The semi-structured interview was deemed an appropriate data collection method for this study. A semi-structured interview utilises specific prompts and open ended questions which give focus to the data collection while retaining flexibility and enabling access to rich data. As the aims of the research were to uncover lived experiences of women engineers which were unknown by the researcher at the outset of the study, it was important that the data collection approach allow participants to voice their experiences and raise issues that are important to them. The flexibility of the semi-structured interview allows this.

The depth to which an interview delves is also guided by the research questions. The aim of an in-depth interview is to go beyond the superficial and to collect rich data. This form of interview is appropriate in situations where “knowledge sought is often taken for granted and is not readily articulated by most members, where the research question involves highly conflicted emotions, or where different individuals or groups involved in the same line of activity have complicated, multiple perspectives on some phenomenon” (Johnston, 2001, p. 105).

The in-depth interview was deemed a suitable technique for this research, as it is effective for collecting rich data and for uncovering and gaining insight into lived experience (Loftland & Loftland, 1995) and can be used to verify or expand on knowledge that the researcher has gained through participation as a member of a particular group or setting (Johnston, 2001).

4.4.2.5 Developing the Interview Guide

Following the choice of semi-structured, in-depth interviewing as data collection method, an interview guide was developed to assist with data collection. Rubin and Rubin (2005) discuss three types of interview questions:

1. Main questions
2. Probes

3. Follow-up questions

Main questions are designed to begin the conversation and to elicit the overall experiences from the interview participant, probing questions are used to clarify and obtain depth, and follow up questions build on answers to the main questions or enable the researcher to explore emergent areas of interest.

In exploring an experience through interview, it is difficult to offer ready-made questions. With a semi-structured format, research questions are less formally stated, and 'main questions' act more as an interview guide and allowing additional questions to evolve as new themes are raised in the interviews. Moustakas (1994) emphasises that "although the primary researcher may in advance develop a series of questions aimed at evoking a comprehensive account of the person's experience of the phenomenon, these are varied, altered, or not used at all when the co-researcher shares the full story of his or her experience of the bracketed question" (p. 114).

For this research, an interview guide was developed with the purpose of directing the interview and as a worksheet for capturing any notes or thoughts during the interview. The guide consisted of a series of questions and prompts, shaped primarily by the research question (Bryman, 2004, 2016), consultation with other researchers and consideration of approaches taken in related research (for example: (Cohen, 1997; Lord, 2007; Norton, 2003). The guide began with an open-ended request for a five-minute overview of the participant's life story, intended to break the ice and encourage the flow of dialogue (Johnston, 2001). This initial question was followed by a conversation guided by a series of questions that explored areas relating to the participant's career to date, and their experiences as they moved into managerial roles.

The interviews focused on the participant's experience in managerial roles. Of particular interest was the passage to their first management role, if that was not their current role, and their definition of the transition from a technical role to a management / leadership role. I was interested in both the process of getting to

that role, the reasons for the decisions, and on reflection the influences that assisted their transition. I was also interested in associated psychological aspects.

In addition to 'main questions', several prompts were listed on the interview guide indicating areas to cover if they did not emerge in responses to the other questions. These prompts encompassed the triggers and influences for their move to manager, transition timing, support systems, and changes experienced as they moved into management and leadership roles. I was also interested in capturing the definition and meaning attached to manager and leader and whether they would define themselves as a manager or leader in their organisation.

The interview guide used in the research is presented in Appendix D. The interview protocol was tested in three initial interviews that formed the pilot study. The pilot study is discussed further in Section 4.4.3.5.

4.4.3 Data Collection

Creswell (2007) presents a circle of activities related to data collection: locating a site or individual, gaining access and making rapport, sampling purposefully, collecting data, recording information, exploring field issues and storing data. Commonly, a distinction is made between gathering experiential material and analysing this material, however, Van Manen (1990) states that "these two acts are not really separable and they should be seen as part of the same process" (p. 63). While acknowledging that data collection and analysis are interlinked, for practical purposes this section focuses on the considerations during design of data collection activities, and their implementation.

4.4.3.1 Sourcing of Participants

A range of sampling strategies are available to the qualitative researcher. As with previous research design decisions, the sampling method is guided by the research question, the purpose of the research and theoretical perspectives. Moustakas (1994) highlights that for research informed by phenomenology, it is essential for research participants to have experienced the phenomenon of

interest, and to be interested and willing to participate in the study. For this research, to capture and explore women's experience of the transition from technical engineer to manager and leader, the sampling strategy for this study required women who self-identified as having experienced this transition to a senior role. Criterion sampling, in which all participants meet particular criteria (Miles & Huberman, 1994) was chosen as an appropriate sourcing strategy for this research.

Locating sufficient or appropriate participants for research can be an obstacle to conducting research. As Warren (2001) states: "one problem in seeking respondents for interview may be not finding anyone to talk to" (p. 87). Recruitment of participants for this research was not anticipated to be a problem. My background as a woman engineer visibly involved in professional organisations, and having experienced the transition to manager myself was expected to assist with locating and recruiting participants for the study. Further, while busy schedules may be a barrier to participation, Reinharz and Chase (2001) note that high achieving women in traditionally male-dominated professions may feel a responsibility to be involved in research relating to their achievement, facilitating participation.

4.4.3.2 Sample Recruitment

To capture and explore women's experience of the transition from technical engineer to manager and leader, sampling for this study involved seeking out women who self-identified as having experienced this transition to a senior role. Women meeting the following criteria were invited to participate in the study:

- Degree qualified engineer.
- Currently working in Australia for a technical organisation employing over 100 people.
- Currently working as a manager and leader in their organisation, that is: an organisational role that includes management, leadership or business responsibilities.

- Has worked in a managerial or leadership capacity for a minimum of twelve months.

Women were requested to have worked in a managerial or leadership capacity for a minimum of twelve months, so that the transition beyond a change in job title and job description could be explored. Women engineers who were anticipating the role transition to manager or leader in the future or those that had declined the opportunity were not eligible for inclusion in the study.

For the purpose of the study, a manager or leader is an engineer in an organisational role that extends beyond a purely technical role and includes one or more of the leadership, management of business responsibilities detailed in the Engineers Australia Engineering Executive (EngExec) Stage 3 competency guidelines (Engineers Australia, 2006, 2011b). The EngExec competency guidelines are referred to for definition of the manager/leader role only. The level of competency of the study participants against these guidelines was not relevant to the study and was not included in the scope of this study.

In addition, participants were restricted to those working for technical organisations in Australia employing over 100 people. For this study, a technical organisation is an organisation that employs engineers and operated within the Australian and New Zealand Standard Industry Classification (ANZSIC) industries listed in The Engineering Profession 2008 Statistical Overview (Kaspura, 2008). A company size of a minimum of 100 employees was chosen as companies of this size are required to have a workplace program and to comply with reporting requirements as per the Workplace Gender Equality Act 2012 (previously the Equal Opportunity for Women in the Workplace Act 1999). Organisations of this size can also be expected to have a range of managerial positions in line with the EngExec guidelines mentioned above.

Using a criterion sampling, participants were recruited from i) the membership of Engineers Australia - the professional body for engineers in Australia - in Western Australia, South Australia, New South Wales and Queensland and ii) my personal network. Snowball or chain sampling, in which respondents assist in

locating other respondents through social and professional networks (Miles & Huberman, 1994) supplemented these sources.

Participants were initially located through the Western Australian division of Engineers Australia. An invitation to participate was issued to the Women in Engineering membership of this division by email. Through this avenue, eight participants were selected to be part of the study. Of the eight Western Australian engineers, five were known personally to the researcher.

Following recruitment in Western Australia, participants were sought from around Australia. The invitation to participate was extended to the Women in Engineering groups in South Australia, New South Wales (Sydney), Victoria and Queensland. This yielded 14 prospective participants. Additional volunteers came forward after hearing of the study through study participants or through my personal and professional networks. Through these channels, a further 10 prospective participants volunteered to be part of the study. A copy of the Invitation to Participate is presented in Appendix B.

A demographic profile of the 22 study participants is provided in Section 5.2.

4.4.3.3 Arranging Interviews

Easterby-Smith et al. (2012) highlight six issues to be considered by researchers when preparing for interviews. Of these, choosing the location of the interview is an important consideration during the scheduling phase. The phenomenological approach of this research aimed to uncover personal experiences of the participants; therefore, it was important that the data was collected in a manner that enabled the participants to voice these experiences freely and raise issues that are important to them.

Creswell (2007) recommends holding interviews in a setting that allows the participant to speak and share ideas without hesitation. As the study is concerned with women's experience in the workplace, a neutral location removed from the participant's workplace may be preferable allowing for less inhibited disclosure. Self-censoring and silencing revealed by previous research involving interviews

with women in managerial and professional roles supports this suggestion (Reinharz & Chase, 2001).

The first set of eight interviews were scheduled in Perth, Western Australia. The initial three interviews formed a pilot study, with the remaining five interviews falling within the main study. Following the interviews in Western Australia, a decision was made to travel from Perth to the major Australian capital cities of Adelaide, Melbourne, Sydney and Canberra over a two-week period to conduct face to face interviews with the study participants. The length of this trip was limited by available university and personal funding. 14 interviews were conducted during this two-week period: seven in Sydney, two in Melbourne, two in Adelaide, and three in Canberra. This resulted in a group of 22 participants that were degree qualified women engineers who at the time of interview were working in Australia as a manager or leader. For the remaining 10 interested women, a convenient interview time could not be found during the two-week period. The details of these women were retained on a list for future use pending outcomes of data analysis.

To schedule the interviews, I contacted the women who had expressed interest in participating in the study and arranged interviews at times and locations convenient to them. The importance of holding the interviews in a setting that allowed the participant to speak and share their ideas without hesitation was emphasised. As the study is concerned with experience in the workplace, it was suggested that a location removed from the participant's workplace may be preferable. More than half of the participants chose to be interviewed in a cafe or restaurant close to their work place. Four of the 22 women invited the researcher into their home, with three of these women known previously to the researcher. Four women chose to be interviewed at their workplace.

After agreeing to an interview time, each participant was sent an Information Sheet providing information on the project, and a consent form (Appendix C). Participants were required to return a signed copy of the consent form prior to their interview.

4.4.3.4 Conducting Interviews

I conducted semi-structured in-depth interviews with each of the participants in person. Each interview began with a brief introduction to the project and an opportunity for the participant to ask questions on the purpose of the research, or with regards to the interview process. The interview then commenced with a request for a five minute overview of the participant's life story. In some cases the response to this initial question lasted up to thirty minutes and evoked a wealth of information without further solicitation. The interviews continued in line with the interview guide as discussed earlier in the chapter.

Each interview was recorded with written permission of each participant for the purposes of transcription of the interview for data analysis. The benefits of audio transcription are debated in the research methods literature. Audio recording facilitates recollection of the conversation after interview completion and also minimises distractions during the interview enabling the researcher to listen, focus on guiding the conversation, and to maintain eye contact (Bryman, 2004, 2016). Alternatively, audio recording may have an inhibiting effect. A reluctance to reveal certain information and have it recorded "on the record" may impact what is revealed during the conversation (Easterby-Smith, Thorpe, & Jackson, 2012; Warren, 2001).

Verbatim transcripts are highly recommended for phenomenological research (King & Horrocks, 2010) and the use of a small recording device did not appear to have an impact on the willingness of the participants to engage in the interview process with each interview lasting from 45 to 80 minutes. In one instance, a participant asked for something to be 'off the record' and this related to social activities and was not relevant to the research objective. To fully engage with the participant's stories, minimal notes were taken during the interviews. This was the intention at the outset of the interview, but did end up being an involuntary act, as I found the stories of the participants so engaging and was immersed in the conversation.

Rubin and Rubin (2005) describe qualitative interviews as extensions of ordinary conversations. To move beyond the ordinary conversation, the interviewer requires skill to establish a connection that enables an open exchange, to focus the interview so that rich, thick and relevant information is elicited, and to achieve a deep understanding of what is said and what is not said. According to Guion, Diehl, and McDonald (2011), a skilled qualitative interviewer is:

1. Open-minded
2. Flexible and responsive
3. Patient
4. Observant
5. A good listener

As a researcher taking a qualitative approach, I endeavoured to see the world through the eyes of the participants in my study (Bryman, 1988) and to understand an experience from their perspective. Obtaining a detailed picture of the personal experience of work-role transition was achieved by adopting a close, rather than distant relationship with the research participants.

Elements important to a successful interview include obtaining trust, establishing rapport and listening (Easterby-Smith et al., 2012). Chadwick et al. (1984) suggests that establishing high levels of rapport with research participants is the most effective way to ensure that questions are answered completely and honestly, while Van Manen (1990) suggests that patience and silence affords participants time to gather recollections and tell their stories.

Influenced by feminist thought, I sought an insider's perspective, rather than one of detached scientific observer, in order to gain a true understanding of the experience of work-role transition and career advancement of women engineers. Further, my own background in engineering, and my experience of the career episode under examination, provided an insider's status or membership to the group.

As a woman engineer interviewing other women engineers, my 'insider' status and pre-existing professional relationships with a small number of the

participants helped me to establish rapport. Pre-existing research / participant relationships in the professional setting may rapidly accelerate rapport building due to common identity, language and professional experience (Asselin, 2003; Kanuha, 2000). McConnell-Henry, James, Chapman, and Francis (2010) highlight associated challenges relating to role conflict, self-disclosure, maintaining confidentiality and pre-existing knowledge. I was cognizant of these issues as I conducted interviews but did not encounter them.

4.4.3.5 Structure of the Study

The interviews were completed in two phases. Initially, a pilot study of three interviews was conducted. The purpose of the pilot study was twofold. Firstly, to trial the interview approach and protocol, as this was my first experience of conducting research interviews. Secondly, the pilot study offered an opportunity to refine the interview questions and data collection procedures for the remaining interviews. The pilot study involved three women engineers known to the researcher prior to the interview. The selection of these particular women for the pilot study was unintentional, but proved beneficial, as the existing relationships helped me adjust to the interview process more easily.

Following each of the initial interviews, a memo was drafted to capture the initial impressions of the interview content and process. A sample memo is included at Appendix E. On reflection, I was generally happy with the quality of the data being generated in these interviews. A few small refinements were made to the wording of some questions and to the questioning technique. For example: at the start of the interview, I moved from collecting demographic information through closed-questions to using open-ended questions to enhance the flow of conversation. Overall, the pilot study confirmed the suitability of the interview guide, acceptance of my interview style by the participants and built my confidence to continue with the remaining interviews.

Following the pilot study, the remaining interviews were conducted in Western Australia and other Australian locations. The interview process followed that described in Section 4.4.3.4. The interview schedule for interviews outside of

Western Australia was crowded, but I attempted to build in time for post-interview reflection. As with the pilot study interviews, interview impressions were captured in a reflective memo, or as notes in my research notebook.

4.4.4 Data Management

Creswell (2007) describes data management as an activity commencing early in the data collection process. It includes capturing of the data, conversion of the data into a format suitable for analysis and organisation for future access. Data management activities undertaken in this research are described in the following sections.

4.4.4.1 *Preparation for Data Analysis*

For interview based research, participant's experiences are captured and converted to words, typically through the use of audio recording and transcription to verbatim text. Researcher's field notes and reflective memos compliment the transcripts to form the raw data (Rubin & Rubin, 2005).

As described in the section 4.4.3.4, all interviews were audio recorded with written permission of participants. The audio file of each interview was then transcribed into a text document for data analysis. To manage the data, each interview participant was allocated a non-identifying code that was used to label audio files, transcripts and memos and later as a reference code labelling excerpts from the participants' interviews in data analysis and discussion of the findings.

To immerse myself in the data, I transcribed the initial eight interviews. The immersion afforded by transcription promoted reflection on the interview process and content. My increasing confidence and skill as an interviewer was apparent and this served to boost my confidence in the remaining interviews. The remaining 14 interviews were transcribed by a professional transcription service. These transcripts were reviewed for accuracy by the researcher, by listening to the audio recording of each transcript while reviewing the electronic transcript. The quality of the transcripts was excellent and the accuracy was

found to be very high, even in instances in which the audio recording was difficult to hear.

Copies of the relevant transcription were sent to each participant by e-mail to ensure that they were satisfied that it was an accurate account of the interview and to allow participants to alter or add comments which they felt would clarify their intended meaning of any aspect of the interview. Only one of the women made minor changes to her transcript and these were concerning an Organisational Department acronym.

Following acceptance of the transcripts by participants, the scripts were sanitised to remove identifying information such as names of people, organisations and places, and references to specific assets or projects.

4.4.4.2 Data Storage

Creswell (2007) notes the importance of data storing procedures, particularly in qualitative research where large volumes of data are generated during collection and analysis. Huberman and Miles (1998) suggest developing a data storage and retrieval system with the purpose of:

- tracking the data,
- access to data throughout the project duration,
- documenting the analyses to allow verification or replication of the study, and
- retaining data and analyses following completion of the study.

While this research was ongoing, the audio files, transcripts and analysis files were labelled with the participant's non-identifying code and stored electronically on computer hard drive, with backup on a portable hard drive. A physical copy of the transcripts was also stored in a project file. The stages of data preparation and analysis were tracked in a Microsoft Excel spreadsheet.

4.4.5 Data Analysis

Following data collection, data is analysed to make sense of the participant's experiences. In the qualitative realm, data analysis is "concerned with producing discursive descriptions and exploring social actor's meanings and interpretations" (Blaikie, 2010, p. 205). The focus of analysis is to extract these meanings from the data and to interpret them so as to gain insight into complex phenomena (Suter, 2011).

There are many techniques, strategies and procedures that can be applied to the analysis of qualitative data. However, analysis guided by the philosophical assumptions of qualitative inquiry share several characteristics related to making sense of the data (Creswell, 2007; Creswell & Poth, 2017; Suter, 2011). These include:

- **Interpretive:** the researcher make sense of the data through interpretation of what is seen, heard and understood. Interpretations are influenced by the researcher's background and prior-knowledge.
- **Inductive:** qualitative data analysis involves the forming of conceptual categories and descriptive themes that constitute a more general perspective. These dimensions emerge from the data, rather than being imposed on the data.
- **Iterative:** Data analysts are frequently "in conversation" with their data, moving back and forth between data and themes, progressing from the particulars of the data to more general perspectives.

Transforming the collected interview data into clear and informative description was a complex and difficult process (Polkinghorne, 1989). Several non-linear iterations of analysis using varied approaches to data management and presentation were performed before the analysis was finalised. This section outlines the approach taken to data analysis for this study. First, Creswell's data analysis spiral and phenomenological techniques that provided a framework for data analysis are described. Then, the implementation of data analysis is described.

4.4.5.1 Data Analysis Framework

Creswell (2007) presents a data analysis spiral that underlies most approaches to analysing qualitative data. The procedures of data analysis are presented as being interrelated, overlapping and simultaneous, while the process of analysis is described as “moving in analytic circles rather than using a fixed linear approach” (ibid p. 150).

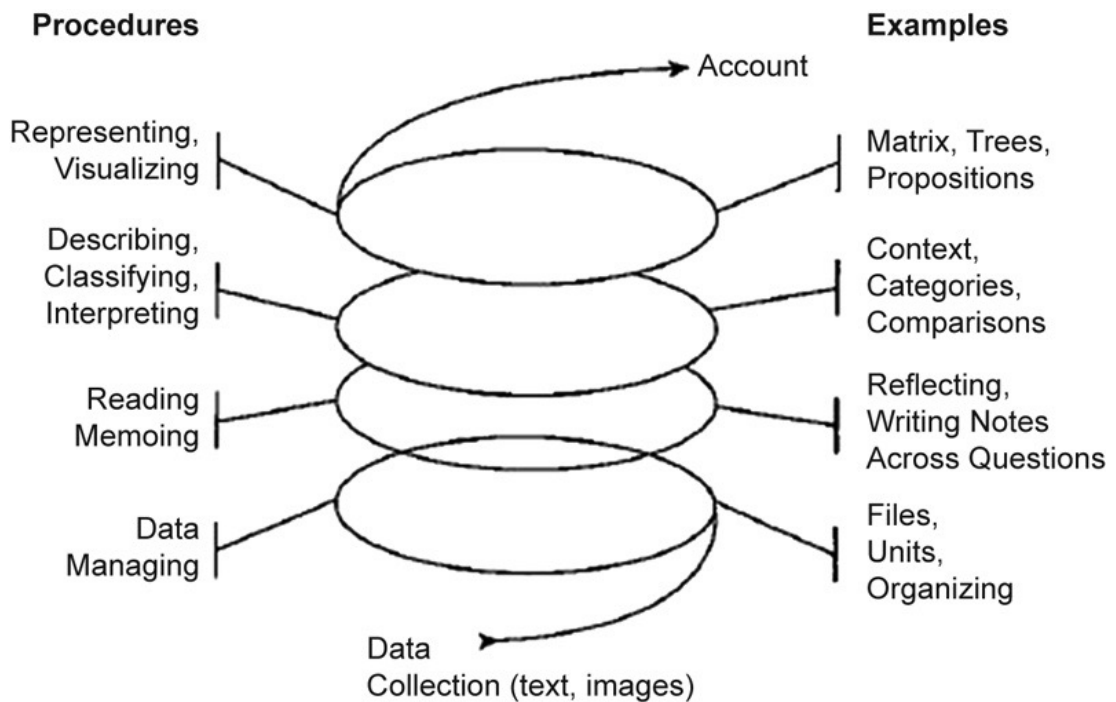


Figure 4.2 - Creswell's Data Analysis Spiral (Creswell, 2007, p. 151)

Creswell's spiral includes the processes of i) Data Managing, ii) Reading/Memoing, iii) Describing/Classifying/Interpreting, and iv) Representing/Visualizing. As discussed in the previous section, data analysis begins during the data collection process. Data management is initiated in the early stages of data collection and is continued and adjusted as analysis progresses. The researcher makes observations, writes field notes and reflects on the interview process as it proceeds.

Exploration of the data is continued by “getting a sense of the whole database” (Creswell, 2007, p. 150). This can be achieved by reading of interview transcripts, listening to audio recordings and writing of reflective notes capturing key ideas

and thoughts. The aim of this stage of analysis is to ‘hear’ what the interviewees have said.

The central activities of ‘Describing/Classifying/Interpreting’ include:

- coding data, and
- reducing the codes into categories or themes.

Saldana (2009) describes coding as a classification process, allocating “a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and /or evocative attribute for a portion of language or visual based data.” (p. 3). The purpose of these activities is to move from the specific to the abstract, through the segregation, grouping, regrouping and relinking of data (Grbich, 2013). Clustering of coded data into broader, more inclusive categories or themes allows the researcher to move towards a conceptual understanding. The final loop is that of Representing and Visualising, in which data is displayed and presented in a manner that provides insight into the matter being investigated.

For research using a phenomenological approach, a range of structured approaches to analysis are available (see for example: Colaizzi (1978), Giorgi (1985) and Moustakas (1994)).

According to Moustakas, phenomenological analysis includes techniques of Phenomenological Reduction and Imaginative Variation. Phenomenological Reduction aims to describe the qualities or the “what?” of the phenomenon under examination. Related steps are presented in Table 4.1:

Table 4.1 – Steps of Phenomenological Reduction

Procedure	Description
Horizontalisation	The data is examined for expressions and statements that are relevant to the experience of the phenomenon being explored. All statements are listed or highlighted.

Reduction and Elimination	The identified statements are considered and all non-repetitive, non-overlapping statements are listed and a meaning unit is assigned to each.
Cluster and Thematise	The meaning units are related and clustered into themes and assigned a thematic label. These are the core themes of the experience.
Validation	The core themes are compared with the transcript of the research participant. The researcher checks for explicit expression of the core themes, and relevance to the experience.
Organising	Horizons and themes are organised into a complete textual description of the experience, based on the individual constituents and themes. The textual description captures the “essential constituents” of the experience. (ibid p.97)

Imaginative Variation aims to illuminate the conditions or the “how?” of the experience being examined. Moustakas asks: “How did the experience of the phenomenon come to be what it is?” This process aims to uncover the elements of the phenomenon, presented as a written description. Colaizzi (1978) refers to this reflective process as the identification of fundamental structure of the phenomenon. From Moustakas (1994, pp. 98, 99) it may involve:

- Using imagination or approaching the phenomenon from different perspectives to discover the “conditions that must exist from something to appear” (p. 98).
- Examining “themes and contexts that account for the emergence of the phenomenon” (p. 99).
- Reflecting on the structures of time, space, physicality, materiality, causality, relation to self and others.
- Searching for illustrative examples of the structural themes within the data, to develop a structural description of the phenomenon.

While I drew on aspects of Moustakas’ techniques to guide my analysis, I did not adhere stringently to a predetermined process. Instead, I adopted a flexible

approach influenced by Van Manen (1990). In contrast to Moustakas, Van Manen remarks that as a methodology, phenomenology aims to be pre-suppositionless and tries “to ward off any tendency towards constructing a predetermined set of fixed procedures, techniques and concepts that would rule-govern the research project” (ibid, p. 29). However, he concedes that phenomenology “definitely has a certain methodos - a way” (ibid p. 29).

Van Manen concurs that phenomenologically informed analysis is reflective, but does not advocate following a prescribed set of procedures. Instead, he suggests a series of methodical activities including:

- reflecting on the essential themes which characterise the phenomenon,
- describing the phenomenon through the art of writing and rewriting, while
- maintaining a strong link to the original question or problem (ibid p30).

Van Manen’s approach complements concerns expressed by feminist researchers regarding use of prescriptive analysis techniques (Maynard, 2004).

A further point of consideration in developing my analytic approach was the role of interpretation, as this is a point of tension in both phenomenological and feminist communities. As discussed previously, contemporary followers of transcendental phenomenology such as Moustakas, Collaizi and Giorgi adopt a descriptive approach to analysis and research outcomes. In contrast, hermeneutic researchers such as Van Manen view interpretation as integral to the research process. In feminist research, Maynard (2004) highlights the tensions between the agenda of giving women voice and documenting what women say without reflecting on it, providing a context or considering what these descriptions might mean. She urges researchers to go beyond description and to employ interpretation and synthesising to connect “what is meant by experience to understanding” (ibid p. 11). Wambui (2013) points out that the researcher makes choices about how to interpret the stories and statements made by research participants.

The choice of data analysis approach was influenced by these views. The epistemological position adopted for this study places interpretation at the heart

of knowledge production, and as such a flexible and interpretive analytic approach was adopted. The key steps of my data analysis are described in the following sections.

4.4.5.2 Preparation

Prior to commencing data analysis, I revisited my own experience as a woman engineer becoming a manager and leader. As with preparing to gather the data, I followed Van Manen's approach of acknowledging my experience and related assumptions and holding them aside, rather than forgetting or ignoring them. I did not include my personal account in the collective data, as suggested in some phenomenological analysis methods (see for example: Moustakas' Modification of the Stevick-Colaizzi-Keen Method in Moustakas (1994). This gesture was symbolic of launching into the data analysis proper "as far as possible free of preconceptions, beliefs, and knowledge of the phenomenon from prior experience", with the view to being "completely open, receptive and naive in listening to and hearing research participants describe their experience" (Moustakas, 1994, p. 22) of career advancement and role transition.

A period of immersion followed the acknowledgement of my own experiences. According to Moustakas, data analysis begins when the researcher reads the transcriptions of interviews. Immersion in the data was achieved by firstly listening to each transcript and reviewing the transcript quality. The audio recordings were then listened to again to gain a sense of the data. The interview transcripts were then read multiple times and notes recorded in a research notebook.

4.4.5.3 Describing, Classifying and Interpreting

After gaining a clear sense of the transcript, I commenced coding of the data. This involved multiple steps informed but not prescribed by Moustakas' methods of analysis, as illustrated in Figure 4.3:

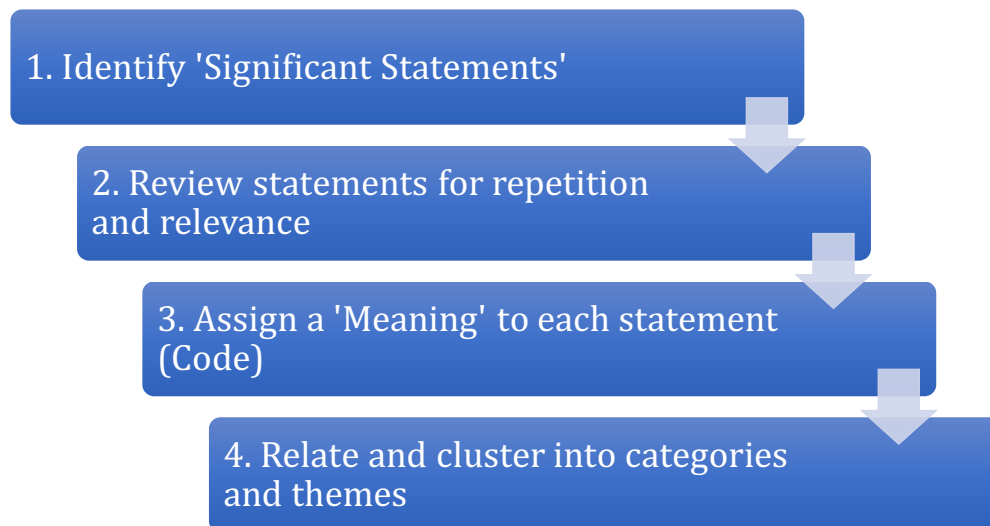


Figure 4.3 – Data Coding Process

First, transcripts were analysed for phrases and comments that were relevant to the phenomenon of women’s transition from engineer to manager and leader. The identification of ‘significant statements’ was not a straightforward process as the conversation forming each interview was complex and convoluted, and statements intertwined multiple ideas.

I began with the coding of the entire transcript of each interview, dividing the transcript into sentences, paragraphs or blocks of text. The coding of segments of text pertinent to the experience of the transition to the managerial role or leadership position created a series of significant statements for each interview. Following Van Manen, the relevance of a statement was determined by focusing on the research question “How do women engineers transition into managers and leaders in technical organisations?” and reflecting on the question “Does the statement seem to have meaning to the participant in describing her experience?” Initially, the process of evaluating the significance of the words of each participant was recorded within the N*Vivo program and in hard-copy notebook.

As a novice researcher, I chose to code an initial selection of eight interviews by hand to become familiar with the process of coding. The hand coding proceeded with a view to transfer the coding as ‘Nodes’ into the N*Vivo program for later analysis. A further group of ten transcripts were coded directly into the N*Vivo

software package. The act of coding was straightforward and the software provided an excellent view of a large amount of data at the nodal level.

Following the identification of significant statements for each transcript, the statements were reviewed and the repetitive, redundant and any statements now deemed irrelevant were removed. This process generated the unique qualities of each participant's experience.

For each of the significant statements, a 'meaning' was assigned. In this step of analysis, Colaizzi (1978) encourages the researcher to formulate a more general restatement for each statement. The formulated meaning was my interpretation of the underlying meaning the statement and was generated by focusing on the question: "What is the meaning of this statement to the participant's experience of moving from engineer to manager or leader?"

As each statement was a fragment of an entire transcript, I returned to each transcript frequently, reading and re-reading the surrounding text to ensure that my perception of the meaning was appropriate and consistent with the words of the participant. I chose to use the first person in the working of each formulated meaning as if to invoke the voice of the participants in my interpretation of their words. Within N*Vivo, the meaning became the 'code' or name of each node.

To identify the themes of the experience of transition, a process of clustering the series of 'formulated meanings' into categories and then broader themes was undertaken. Choices of category and theme groupings were recorded in the memo function within N*Vivo and within hard copy notebooks. Within N*Vivo, parent nodes served as containers to house categories and themes of clustered statement or nodes. Initial observations concerning the nature of the theme clusters and observed patterns were recorded.

The clustering process was iterative. As the initial coding, assigning of formulated meanings and categories were completed for a set of interviews, the 'formulated meanings' initially assigned to each node were reviewed repeatedly to ensure that they were considered, descriptive and an accurate reflection of the original conversation. The content of each category and theme were also reviewed. In

some cases, this lead to the transfer of statements from one category to another, or to the further grouping of statements into larger or more detailed theme folders.

4.4.5.4 *Data Analysis Revisited*

As analysis progressed, the coding of transcripts into N*Vivo proved limiting. Visualisation of the trail of analysis from transcript to significant statement to categories and themes was problematic, and I experienced a feeling of losing sense of the data.

The coding strategy was revisited, and a revised approach incorporating Microsoft Word and Excel was developed. The modifications to the analysis process are summarised in Table 4.2:

Table 4.2 – Modifications to Data Analysis Process

Analysis Step	Action
Significant Statements	<p>Coding of significant statements was performed within Microsoft Word using the Highlight and Comment functions.</p> <p>Each highlighted segment was attributed a sequential statement number documented using the Comment function.</p>
Describing	<p>A tabular memo was created in MS Excel for each transcript listing i) Statement Number ii) Significant Statement and iii) Formulated Meaning. This afforded a clear view of each statement and the assigned Formulated Meaning. An example of the formation of these ‘formulated meanings’ from the significant statements is presented in Appendix F.</p> <p>Each statement and assigned meaning in the tabular memo was reviewed, with reflection on the research question. Formulated meanings were revised to be more considered and descriptive. Repetitive or irrelevant statements were</p>

	<p>removed, as indicated by scoring out of text. Modifications were made and notes recorded.</p> <p>For transcripts initially coded within N*Vivo, modifications were made to reflect the analysis performed within MS Word and Excel. For the remaining transcripts, coding was performed. This acknowledged the differing strengths of each software programmes in data management.</p>
Classifying / Interpreting	<p>The tabular memo in MS Excel was expanded to include multiple columns for categories and themes. The Category and Theme labels assigned to each statement were recorded. This provided an opportunity to review themes assigned to data coded within N*Vivo.</p> <p>Within N*Vivo, modifications were made to reflect the analysis performed within MS Excel. Parent nodes were created to present each category, theme and clusters of themes. Data was organised by grouping the relevant nodes within these parent nodes.</p>

Although time consuming and requiring rework of analysis already completed, the revised analysis strategy proved beneficial in subsequent stages of data analysis. The new approach allowed for easier data manipulation, visualisation of a clear decision trail and additional opportunities to review assigned meaning, categories and themes. Ten key themes emerged from the classifying and interpreting of the women's interview transcripts. A sample of data analysis is presented in Appendix F.

4.4.6 Synthesis of Findings

Bazeley (2009) highlights the importance of establishing connections between themes to arrive at a rich and complete data analysis. The final stage of data analysis involved moving beyond the individual data points and reflecting on the 10 key themes that had emerged. Drawing on phenomenological processes of

synthesis, imaginative variation and Van Manen's phenomenological writing, I considered the following questions and used memos to capture my responses:

- What is this theme about?
- What is the story that the data tells?
- What is essential to the phenomenon of role transition?

While analysing the data, writing about the themes and discussing them at academic conferences (Marinelli, 2010a, 2011a, 2011b; Marinelli et al., 2012a, 2012b), the structure of time emerged as a key dimension of the transition experience. This was not well captured by any particular theme and so I considered this dimension by considering:

- If transition is considered as a function of time, how and when does each theme come into play as time passes?

Women's experiences of the transition journey are discussed against this temporal framework in Chapter 6.

The process of writing about the key themes that emerged from the phenomenological analysis of interview data revealed links and relationships between several of the themes. While the themes indicated important aspects of the transition experience, I felt that alone they did not express the true complexity of the transition to manager as experienced by my study participants. Reflection on the interrelation of the themes that emerged from the data generated three core theme groups and three dimensions. These were then conceptualised as a model illustrating the women's experience of transition and expresses the complexity of their experience.

The final stage of working with the data is to approach the "essence" of the phenomenon. Creswell (2007) explains that this descriptive passage focuses on the common experiences and underlying structures of the experience for the participants. Moustakas (1994) clarifies that the essence of a phenomenon is not exhaustive, that is: it is representative of the experience at a certain time and place, and is written from the perspective of an individual researcher.

Van Manen (1990) suggests that the essence is captured on reflecting on the essential themes of the phenomenon, particularly on the question “what is it that constitutes the nature of the lived experience?” (p. 32). The essence of an experience is captured if upon reading the description, the reader feels an understanding of what it is like for someone to experience it (Creswell, 2007). The conceptual model and descriptive essence of women engineers’ transition to manager and leader is presented in Chapter 7.

4.4.7 Returning to the Literature and Development of the Discussion

Upon completion of the data analysis, the phenomenological researcher returns to the literature. As described previously, qualitative research has an emergent nature in which the meaningful dimensions of the research subject emerge from the data through reflective data analysis.

Data collection and analysis enable the researcher to enter the phenomenon, uncover that which is meaningful to the participants, and capture the essence of the phenomenon. Having gained insight into the phenomenon, the researcher returns to the literature to:

- integrate the findings of the analysis with the existing literature and develop links with theory, adding to the understanding and knowing of people and their everyday experiences;
- distinguish the findings from prior research;
- discuss the findings in terms of social meanings, implications and practice; and
- outline avenues for further research and exploration (Moustakas, 1994; Randolph, 2009).

As with the initial literature review, the process of review drew on Cooper (1984) and the parameters for the review were guided by what was uncovered by the data analysis. The discussion of the research findings in relation to extant literature is presented in Chapter 7.

4.4.8 Ethical Considerations

Blaikie (2010) points out that in the exploration of aspects individual and social life in social research, ethical issues may be encountered. He highlights the value of making explicit the ethical implications of a project and mitigation and response processes. Four major points to be addressed in this stage of research design, as suggested by Blaikie, are presented in Table 4.3.

Table 4.3 - Ethical Considerations in Qualitative Research

1. Voluntary participation	"Research participants cannot be required to be involved, and if they agree to, they must know that they have the right to withdraw at any time." (p.31)
2. Informed consent	"This involves informing participants of the nature and purpose of the research, the method that will be used, what will be required of them, and how the results will be used." (p.31)
3. Protecting the interests of the research participants	"The research participants' privacy must be protected by ensuring that their anonymity is preserved and the confidentiality of the data guaranteed." (p. 31)
4. Researching with integrity	"The researcher must ensure that this research is conducted according to acceptable standards of practice, and without fraud, deception and dishonesty." (p. 31)

Prior to the commencement of this research, the research proposal including identification of potential ethical concerns and mitigations was submitted through the Graduate Business School Research and Development Ethics Committee at Curtin University for review. This review approved the proposed research design as compliant with requirements (approval number GSB-06-09). The identified ethical considerations are described below.

As indicated in section 4.4.3.3, all participants were informed of the objectives of the project and of the intention to record discussions for transcription and analysis. These details were confirmed in writing and the written consent of the participant was obtained before any interviewing or recording commenced. A sample of the written consent form for this project is included in Appendix C. Following transcription, participants were provided with a copy of the transcript and were given the opportunity to confirm its accuracy or to alter any section/s they felt did not reflect their intended meaning.

The primary ethical issue in this study surrounded participant confidentiality. The research involved the exploration of participants' personal experience of work related events through interview. The collection of quality data required that the participants speak and share ideas freely, with confidence that any sensitive information revealed during interviews was confidential and non-traceable. This was of particular importance given my association with the local engineering profession and involvement in the Engineers Australia Women in Engineering panel. To ensure that participants were not identifiable beyond the interview, transcripts were labelled with a non-identifiable code which was linked to a participant list held only by the researcher. In addition, the transcripts were edited to remove information such as names of people and organisations, location information, and details of specific projects or assets, to protect the identity of the participant while preserving the meaning of the discussion.

An unanticipated issue that arose during the conduct of interviews was that for a small number of participants, the interviews tapped into high levels of stress and were at times overwhelming, eliciting emotional distress. While experiences of emotional distress in research of sensitive topics such as illness and bereavement are well documented (Clarke, 2006), this was not anticipated in this research given the subject of enquiry. However, as mentioned earlier, managerial and professional women are not immune to silencing and self-censorship (Reinharz & Chase, 2001). Interviews can provide an opportunity for reflection and self-discovery by participants (Murray, 2003; Rossetto, 2014). I ensured that I was empathetic and gave participants time if needed following any emotional discussions during the interview.

4.4.9 Ensuring Research Quality

How best to demonstrate rigorous qualitative, interpretive research is an area of active debate in the literature. Rolfe (2006) highlights several perspectives relating to the type of criteria suitable for evaluation of qualitative research. Some researchers favour the application of measures associated with quantitative research such as reliability and validity to qualitative studies (Morse, Barrett, Mayan, Olson, & Spiers, 2002). An alternative position is the development of criteria specific for qualitative research, as the “issues at stake in qualitative research are fundamentally different from those in quantitative research” (Rolfe, 2006, p. 305). The final perspective highlighted by Rolfe, and echoed by Seale (2011) questions whether specifying criteria to determine the quality of qualitative research is appropriate, as measureable criteria align with the positivist paradigm and conflict with the creative, exploratory and interpretive nature of qualitative research. Further, given the diversity of philosophical and theoretical basis within qualitative research, a single set of criteria may not be possible.

Most qualitative researchers choose to justify their research outcomes in some way (Symon and Cassell, 1998). Various frameworks and sets of criteria have been developed and continue to emerge. Some emphasise methodological criteria or “systematic, thorough, conscious method” (Lincoln, 2011, p. 3). For example: Guba and Lincoln’s ‘foundational’ criteria of credibility, transferability, dependability and confirmability, later expanded to include the concepts of trustworthiness and authenticity (Lincoln, 1995; Lincoln & Guba, 1985), and Creswell’s characteristics of a good research study, using recognised data collection and analysis procedures (Creswell, 2007). Other researchers consider the concept of ‘interpretive rigour’ and propose criteria for assessing the outcomes of interpretive enquiry, rather than solely the application of methods. Lincoln et al. (2011) question: “are these findings sufficiently authentic that I may trust myself in acting on their implications?” (p. 120).

Ways of pursuing and establishing research quality are dependent on the chosen research approach and theoretical perspectives, and the position of the

researcher within these perspectives (Altheide and Johnson, 2011). For this research, informed by feminist and phenomenological perspectives, research quality was addressed in several ways.

The concept of adequacy emerges within both feminist and phenomenological perspectives. Concerning feminist research, Hall and Stevens (1991) propose that the quality of research be determined by:

“the adequacy of the whole process of enquiry, relative to the purposes of the study, rather than by standards that focus only on the accuracy and reliability of measurements within the study” (ibid p. 20)

Further, ethical issues are relevant to the quality of feminist research as “the adequacy of the findings are integrally related to the nature and fairness of the interactive processes through which they were accumulated and analysed” (ibid p. 20).

Within phenomenology, Creswell (2007, p. 215) describes five standards with emphasis on both procedure and outcome for assessing the quality of phenomenological work:

- An understanding of the philosophical tenants of phenomenology.
- A clear ‘phenomenon’ to study that is articulated in a concise way.
- Use of procedures of data analysis in phenomenology.
- Communication of the overall essence of the experience of the participants.
- Reflexivity through the study.

Van Manen (1990) places emphasis on research outcomes, consistent with his view that “the method of phenomenology and hermeneutics is that there is no method” (p. 30). Van Manen describes the outcomes of good phenomenological research as “an adequate elucidation of some aspect of the lifeworld – it resonates with our sense of lived life” (ibid p. 27). He highlights the concept of the ‘phenomenological nod’ - that is: “something that we can nod to, recognizing it as an experience that we have had, or could have had” (ibid p. 27) – as a measure of successful phenomenological research.

In this study, an integrative approach to ensuring research quality was adopted. A balance between methodological concerns and research outcome was sought (Pereira, 2012). Instead of seeking to achieve specific quality criteria, I focused on the purpose of the research and the research question, and establishing, maintaining and making clear the connection between these, the research philosophy and data collection and analysis techniques.

Drawing on Hall and Stevens (1991), Van Manen (1990), Lincoln and Guba (1985) and Lincoln et al. (2011), Table 4.4 summarises the qualities that guided “thoughtful decisions about design strategies, including methods” (Lincoln, 2011, p. 3), procedures, techniques and lines of questioning taken to ensure research quality:

Table 4.4 – Qualities Guiding Research Decisions

Quality	Meaning
Consistency and Coherence	Research processes are appropriate for problem being explored; research outcomes are well founded in the data, and related to the research objectives.
Transparency	Documentation of data, methods and decisions made during the project.
Credibility	Research outcomes constitute credible descriptions and explanations of women’s experiences that can be understood by both insiders and outsiders.
Fairness	Consideration and discussion of all participant’s experiences; conduct of research in an ethical manner.
Reflexivity	Awareness of my values, presumptions, experiences and their effect on research design, implementation and research outcomes.

The actions taken are woven through the presentation of the enquiry framework and research process in previous sections, and are summarised in Table 4.5:

Table 4.5 - Actions to Ensure Research Quality

Quality	Actions taken
Consistency and Coherence	<ul style="list-style-type: none"> • Situated research within an appropriate and considered enquiry framework (Section 4.2). • Applied data collection and analysis procedures coherent with the enquiry framework (Section 4.3). • During analysis, focusing on the research objective of elucidating women's experience. • Ongoing questioning of my interpretation and analysis to remain faithful to participant's accounts.
Transparency	<ul style="list-style-type: none"> • Made clear the logic of the research design and the decisions made (Sections 4.2 and 4.3).
Credibility	<ul style="list-style-type: none"> • Validation of interview transcripts by all participants via email. • Ongoing discussion of the research process and emerging findings with supervisors and peers. • Presentation of work in progress at several academic workshops and conferences. • Testing of 'Phenomenological Nod' in discussions with engineering peers.
Fairness	<ul style="list-style-type: none"> • Considered all participants' voices during data analysis. • Efforts to surfacing, rather than suppress, conflicting or contradictory data. • Ethical considerations specific to this study identified and addressed (Section 4.3.8).
Reflexivity	<ul style="list-style-type: none"> • Making clear my own experience of the phenomenon (Appendix A). • Maintaining awareness of the influence of this experience at all stages of the research process: on my relationships with research participants, data collection, data analysis and reporting of outcomes.

4.5 Chapter Summary

This chapter has detailed the methodological issues relating to the study of women's experiences of transition to management and leadership roles in Australia. The chapter made clear the research question and objectives that drive this study. The enquiry framework, including philosophical and theoretical perspectives taken, used to answer the research question was discussed. Then, the research design, stages of research and methods of data collection and analysis were outlined. Concurrently, my experience of implementation of this design was described. Finally, ethical and research quality issues were considered, and procedures to ensure an ethical and quality research study discussed.

The next chapter commences presentation of the findings from the research.

5 A Manager and Leader in the Engineering Profession

5.1 Introduction

This chapter begins the reporting of the experiences of the transition from engineer to manager and leader from interviews with twenty-two women managers and leaders from the engineering profession in Australia. The findings are presented and discussed over three chapters. Chapter 5 explores women engineers' conceptualisations of managerial and leadership roles. Chapter 6 provides a portrait of the experience of transition to manager and leader for women engineers, drawing on key themes that emerged from data analysis and highlighting common elements and points of difference amongst the women's experiences. Chapter 7 moves beyond themes and develops the theoretical contribution of these findings. A conceptual model – the *Transition Continuum Model* – is presented and frames the discussion in relation to extant literature.

This chapter begins with a summary of the demographic profile of the participants. Then, findings related to the women's conceptualisation of manager and leader in the engineering profession are presented. Reflections on the participant's own managerial and leadership roles and their observations of other managers and leaders in their profession provide an understanding of how the women perceive and shape their understanding of their roles as managers and leaders and the qualities required to successfully reach and perform these roles. This conceptualisation provides a view of management and leadership in the engineering profession not previously documented.

5.1.1 Presentation of the Findings

Excerpts from the participants' interviews illustrate the discussion of the findings. Direct excerpts are presented in italic text. A double forward slash // indicates a separate or following statement made by the same participant, that reinforces or emphasises their initial statement. Text in square brackets [] indicates text that I have altered to preserve the anonymity of the participants, or text that I have added to clarify a statement. This includes data such as

organisational names and details, project or asset information or names of colleagues or family members.

5.2 Demographic Profile

The 22 women interviewed for this study were employed in a range of industries and organisations in Australia. Eight women worked in Infrastructure, Building and Construction, five women in the resources industry - which encompasses oil and gas and mining - both major revenue earners for Australia, while four women worked in the transport industry. The remaining participants were working in Defence, and water and environment related industries. While diversity of industry can be observed across the group, concentrations of employment can be seen in certain locations, for example, the prevalence of employment in the resources industry in Western Australia, and the defence sector in Canberra.

The women were also employed by a range of organisational types. A large proportion of the group (eight of 22) worked for Engineering and Technical Services companies. These organisations provide engineering expertise to 'client' or 'owner' organisations across a broad range of industries that may not choose to hold required expertise in-house. Four women worked for government organisations, three women worked for 'client' organisations and a further three worked for engineering consulting companies. The remaining participant was employed by a project management company.

When asked about the role they associated with first becoming a manager and leader, the women named a variety of positions. These included:

- Associate
- Team Leader / Specialty Manager / Discipline Leader
- Project Manager
- Engineering Officer
- Lead Engineer
- Design Manager
- Specialist

- Construction Manager
- Business Transformation Manager

The most common transition was from Project Engineer to Project Manager or from Discipline Engineer to Team Leader, taking on responsibility for projects or programs, or for a team of engineers or other technical professionals. Most of the women were offered a position in their existing function or area of technical expertise.

The participant group encompassed relatively new managers to experienced senior executives. At the time of interview, the women were between 30 to 50 years of age and had between 8 and 30 years of work experience. The newest manager had 12 months of experience in a role that she identified as a managerial or leadership role, while the most experienced manager had worked for over 20 years in a managerial capacity. Most participants had less than 10 years of managerial experience, with the largest proportion holding less than 5 years of managerial experience. Some women, particularly those aged in their late 30s and early 40s, spoke of being the first woman engineer in an organisation or the only woman on a site during their careers.

The women were highly educated. In line with the participation criteria, all women held a qualification in engineering - for most this was an undergraduate degree in engineering. At the time of interview, ten women also held a postgraduate qualification in engineering or a related technical discipline, including three participants who had completed doctorate (PhD) degrees. A smaller number of participants had pursued a Master of Business Administration (MBA) qualification. Four participants held an MBA or were progressing towards one at the time of interview. One had commenced an MBA but withdrew before completion. Several women obtained their engineering qualifications outside of Australia, and then migrated to Australia as skilled migrants, bringing with them international work experience.

Most women participating in this study were married and more than half had children or step-children at the time of interview. For women with children, over

50 per cent had more than one child and it was more common for these women to have either all children under 5 years old, or of school age. Of interest, most women did not have children at the time that they identified with first taking on a management or leadership role. A summary of the participant's demographic information is presented in Table 5.1.

Table 5.1 - Demographic Information of Interview Participants

Description	Number of Participants
Years of Work Experience	
0-5	Nil
6-10	2
11-15	8
15+	12
Years of Management /Leadership Experience	
0-5	10
6-10	3
11-15	6
15+	2
Education Level (highest degree)	
Bachelor	10
Graduate Diploma or Masters (technical)	7
MBA	2 complete, 2 in progress
PhD	3
Marital Status (at time of interview)	
Single	4
Married/Defacto	18
Divorced	Nil
Number of children at home (at time of interview)	
Nil	6
1	5
2	8
3	1
Ages of Children at home (at time of interview)	
Pre-school	5

School	5
University/Post-school	3
Adult	2
Number of children at home (at time of transition)	
Nil	14
1	2
2	3
3+	1
Ages of Children (at time of transition)	
Pre-school	3
School	2
University/Post-school	1
Adult	Nil

5.3 A Manager and Leader in Engineering

To understand the experience of becoming a manager and leader in the engineering profession, it is important to establish a picture of a manager and leader in engineering. What is a manager and leader in engineering, from the point of view of the women that participated in this study? What organisational roles do they occupy and what do they do? What qualities and behaviours are associated with those that occupy these roles? The findings in this section are derived from the women's descriptions of their managerial roles and from their observations and perceptions of other managers within their profession.

5.3.1 What Does a Manager and Leader Do?

The women clearly expressed the purpose of their managerial or leadership role. From their perspective, being a manager and leader meant delivering projects and capabilities – for example: the construction of infrastructure such as roads or hospitals, managing the operation and maintenance of existing assets, providing services of a technical nature through engineering consultancy, or implementing programs of change through an organisation. As one participant noted:

“Ultimately, I’m here to deliver a capability.” (M9)

To achieve these purposes, the manager and leader in engineering performs a wide variety of tasks requiring a range of skills. Words used to describe their roles included multifaceted, varied and *“a bit scattered”* (M4). One participant, now occupying a senior role in the defence force explained colourfully:

“It’s just about every bloody thing under the sun.” (M11)

Several of the women expressed a need to balance the many aspects of the role and the challenge of doing so. Long working hours and feelings of overload were common, with pressure to meet *“unrealistic expectations”* (M22) affecting wellbeing and family life.

5.3.1.1 Tasks of the Managerial Role

The main tasks performed by the women in their initial managerial roles can be broadly grouped as:

1. Relational: relating to managing other people and leading a team;
2. Organising: associated with coordination, resource allocation, project planning and delivery; and
3. Technical: relating to undertaking technical work, or providing technical expertise to achieve required outcomes.

The keys tasks performed by the women in their management roles are summarised in Figure 5.1.



Figure 5.1 - The Tasks of Management and Leadership Roles

5.3.1.2 Relational

When describing their work as managers and leaders, there was a noticeable focus on their relations with other people within the organisation. This included their responsibility for managing and developing others, achieving results through the efforts of others, and tasks that relied heavily on relationships with other people including communication, liaison and business development.

Managing Others

“Managing people is so underrated, but such a very important part.” (M12)

For all women, becoming a manager and leader involved managing others. For many of the participants, assuming responsibility for other people in the workplace indicated their move to a managerial role.

"I took over my role, as I say, from my previous boss, which is running of the [asset] service group. So that means 14 staff." (M21)

"that's where I first took on a role where I was managing other people as opposed to just doing my day to day job." (P2)

Managing others was perceived as a mixed blessing. A small number of women overtly expressed an enjoyment derived from managing others. More frequently, managing others was revealed to be one of the more challenging aspects of being a manager. One woman explained:

"That was definitely the biggest change, having to deal with all the people and all the problems that people have and you don't really realise until you're looking after a team." (M16)

The same woman went on to highlight the demand that managing others places on a manager's time.

"Just the amount of the time that people take up. I mean, not everyone. There are people who don't have any problems or perceived problems, they just carry on working, but there are others who are quite a lot of work. Yeah. So I hadn't really considered that before because I'm a low maintenance person. I didn't realise there were these other people out there." (M16)

Varied Teams

An interesting point that emerged from the data was that many women managed multi-functional and varied teams. Having responsibility for other engineers was common, but team members often came from other business functions including other technical professionals such as surveyors, scientists and drafters, blue-collar workers and tradespeople such as equipment operators, construction or mine workers, and administrative staff.

“then in the same company, I moved into project management, so minor projects and managing more staff, some technical and some not technical.” (M12)

For some women, their team extended to workers from other organisations. This was particularly the case for women working in owner/operator companies or engineering companies that sub-contracted work to other organisations.

“I came back to [Current Company] in 2003 and through 2003/04, that’s when I actually had some of my first management experience, direct people management experience and it lead to lead [discipline] engineer for [major project] front end design. That was managing only a small, only me and one other in the [current company] team but it was managing on the contractor’s side, a dozen or so [discipline] engineers.” (M5)

It was not uncommon for these women to become managers of people with a wide range of age and experience. Managing older team members with substantial experience was highlighted as a challenge for several new managers.

“when I first took over the group, it must have been in 2000 or 2001, and we had probably about six people then. There were a couple of really good young engineers, young graduates, a senior person who was a very difficult person, because he had an Associate Diploma but had a chip on his shoulder and felt he should have been an Engineer. A couple of drafters as well.” (M8)

The People Manager as Coach, Mentor, Guide and Advocate

The role of manager as coach, mentor and guide featured in the interview data. Many women spoke about this aspect of their people manager role.

“Managing their work to some extent but not... at fairly arm’s length, they’re grown-ups - they know what they are supposed to be doing. But also mentoring them, coaching them and making sure that they develop in areas that they are either interested in and keeping working interesting for them as well - I see that as a pretty critical part of my role.” (M4)

As indicated in the quote above, the development of individual team members was central to this coaching and mentoring perspective. This was manifested through the transfer of technical knowledge and by being the broker of development opportunities. One Team Leader explained how she saw her move to manager as an opportunity to guide and help her team. She gave an example of identifying opportunities that expanded skill and increased visibility of her team members within her organisation.

"Just keeping an eye on my group // As well as also bringing them in to client presentations, bringing the staff in to do these as well, so the other managers see them, that sort of thing." (M16)

In the same vein, other women described themselves as advocates of their team:

"So I think it was that mutual respect in both ways, that I always had their best interests at heart, always made sure the right people heard about their good work, so that they could get the promotion, and all that sort of stuff. It was very good." (M8)

Caring

Caring language was commonly used to describe the manager-subordinate relationship. The act of managing others was described as "looking after a team" or "keeping staff happy".

"But part of my job is being there for people, for anything for the running of the team." (M21)

This focus on the wellbeing and development of staff was a mechanism for building and leading a cohesive team because:

"It was important that we knew where we were going and who was working on what job and who to go to with what and that they felt part of the team... yeah, it was about bringing everybody together." (M22)

Achieving Through Others

Despite the challenges of managing others, the importance of managing others and the role of the team in achieving business outcomes was emphasised. Through their teams and as part of those teams, the delivery of services or projects was achieved.

Several women described their role as achieving goals and outcomes through the efforts of others:

"I have a team of people, I guess there are two in my direct team and then there are a bunch of people in a virtual team, um, around me that kind of contribute to what I am doing either directly or indirectly." (M4)

Another participant, who was tasked with managing a function with which she was not familiar, revealed her reliance on the expertise of her team in getting the work done:

"suddenly, you'd be made the piping manager and it's like 'but I don't know how to pipe' and it's like 'doesn't matter, you've got this team of 15 guys, make sure they get it done on time'. And so you learnt in a sort of in a very reverse way but you were still responsible for them." (M2)

The emphasis on guiding, developing, motivating and caring for staff described previously links to the role of the teams in achieving business outcomes.

"You have six people here you get to know really well. You know about their social commitments, you know, their lives, their underlying requirements for a change or what's important to them, what drives them, and hence you help them with their performance so that they work better for the project leaders." (M21)

Communication, Collaboration and Liaison

Aside from the tasks and perceived roles directly linked to managing a team of people, the women spoke of several other tasks with a highly relational aspect.

These included advocacy, liaison and communication internally and with external and industry stakeholders, managing change and business development.

Many women described the communicative aspects of their managerial roles. One woman described her role in terms of internal relationships:

“So my first management responsibility was literally to manage the modification activities on the [Equipment Name] for – I didn’t know how much it was worth back then. So the liaison with the people doing the modification activity, the liaison with the operations guys to make sure that the [equipment type] were available, grounded, getting all the components in place.” (M9)

Another described her emphasis on building external relationships:

“I don’t have the title officially as Client Relationship Manager, which is what we call our people that directly interface with and try to build relationships with clients... that’s where I’m trying to head I think.” (M3)

Managing change within organisations was also a feature of the managerial role, and was effected through organisational relationships. One manager in the military explained the impact of the introduction of a new type of asset to the organisation. Her role was not only to manager the large technical and logistical changes associated with this, but also the impact on people within the organisation:

“the [assets] come with quite significant cultural change because of, firstly, their size. // And so, by the time the [asset type 2] and the [asset type 1] come on-line in around about 2014, it will be a whole new [Organisation].” (M11)

Other women explained that business development type activities formed part of their managerial role. This was particularly the case with women working in consulting or engineering service type companies. Building relationships was seen as key to these activities:

"I really enjoy getting in and understanding what the client's needs are and then relaying them to the team. I enjoy the client liaison more than anything, actually being out there on the front line." (M21)

Leading and Influencing

Explicit references to leading and leadership were uncommon in the descriptions that women gave of their roles. Instead, leadership as part of more senior organisational roles was implicit in their descriptions of managing others and achieving results through their teams. For those that did designate leadership as a function of their role, it was in relation to leading others:

"I suppose moving from a technical role where I was responsible for my work and submitting it, then moving into more management roles, having to mentor those that were under me and to be able to guide them and lead them in the way that I would have wanted to be led." (M12)

As women in senior organisational roles, some women described leading other women as an inadvertent aspect of their work. This related to being a role model or a positive example for other women.

"because being a female in an engineering environment you almost had a bit of a leadership role with regards to other women." (M13)

Finally, some women spoken about leading in terms of affirming or questioning their leadership style.

An alternative conceptualisation of leadership was having influence within the organisation. One participant discussed this in terms of her loss of influence after leaving an organisational role.

"there's an issue about level of influence. And influence within the organisation. So, I... because I don't have that management role, I don't sit in the leadership team and yet I do feel that I have something to contribute there." (M5)

However, leadership was not always synonymous with an organisational role. Leadership was also described in an unofficial capacity – as leading in their own way, indirect influence, or leading from within:

“I’ve always thought that you can lead from within... whatever you’re doing at that time, you have the ability to lead or to be a positive... it’s not even about leading, but to be a positive example to other people.” (M3)

5.3.1.3 Organising

Organising tasks form the second grouping of tasks associated with the managerial and leadership roles. These encompass tasks such as coordinating activities and people, project planning and delivery, including financial management of projects, monitoring and control activities, and other planning tasks.

“Looking after an \$80 million budget, how much do we put into [area 1], how much do you put into [area 2]? Trying to weigh up how you divvy up the dollars and what strategies you have in place for the asset that you’ve got.” (M18)

Coordination

Coordination was a common descriptor of the work of a manager and leader in engineering. This entailed coordinating both activities and people within their own teams, between sections of their organisation, and externally. One manager explained how she coordinated her team’s efforts on multiple projects:

“My main deliverable was those PFDs. And then we would just have input as needed into the other activities. So some would be coordination... we would have the design team leads of different projects. So we would have, as I mentioned six different projects going on at each time, each with their own design team lead so we would provide the overall process diagrams for the plant and they would do the specific design for the specific assets that they were working on.” (M3)

Another described the coordination activities between different offices within the same organisation. Regular meeting enables coordination of marketing activities, resource allocation and assurance activities.

“We used to get together with the transport group in [Australian State] every month or so and have marketing meetings or coordination meetings or whatever.” (M21)

Resource Management

A further emphasis was on resource management as managing the work frequently entailed managing other people doing the work. This focus is distinct from ‘managing others’ as presented in the previous section, which has a strong relational undercurrent.

In a simple form, resource management requires resourcing current and future work with a team with appropriate skills and expertise to enable successful execution and completion of the work.

“I’ve got to divide all the workload. I will get all the requests from our sales reps, put them all into planners and decide what we can do. We have a matrix of what we are allowed to do and what we are not allowed to do due to experiences and things like that.” (M17)

For many women, this aspect of the work was more complex as they managed resources across multiple offices, to suit a highly changeable workload, and required a dynamic and flexible approach.

“We’ve got about 55 engineers who do [X] in Australia and so we also share work between the other offices. I guess I coordinate that as well.” (M16)

For those working in consulting or service provision, management of resources was strongly linked to the current and future workload and reactive to client needs, which can be highly changeable.

"We had today, that a client has a situation on site where he says the site is closed, we need support, it's not your fault, you've done nothing but we need to have certain props to stabilise the situation to be able to go back to work. That is stuff where you just have to have a little bit of time on the side that you can re-juggle the work." (M17)

Planning

Planning activities also featured in the women's recollections. Planning had several guises. For some women, planning was central to the work or project that they were involved in, for example their project was in a planning phase rather than an execution phase; or planning was the commodity that they were contracted to deliver by a client.

"I'm responsible for the planning of a delivery project // It's looking at the upgrade of [Road Name] to an expressway // It's also looking at the feasibility of extending a rail line, public transport interchange as well as park and ride facility." (M13)

Alternatively, planning was part of the managerial role – for example: developing business strategy and business plans. One manager explained how her role involved setting the strategy for a new asset within the organisation:

"A big part of it is, if you like, setting up the 'business model', for want of a better term, for how we're going to sustain these [assets]. And then, dealing with the ever present and ongoing fights relating to resourcing, be that both financial and personnel." (M11)

Another described her role as embedded in strategy and planning, so that others could 'do the work':

"I mean, when you actually think what I do, I go to meetings and I talk. Paperwork wise I don't do much because others do that, but it's more the strategic context, more so the planning, this is where we're going, thinking

about what the political side is because we're all in this game and it's all part and parcel of it." (M13)

Project Planning and Delivery

Managing engineering work was frequently described in terms of project planning and delivery. The project-based nature of much of their work meant that several women were responsible for delivering work through planning, budgeting and developing schedules, financial management of projects and production of engineering deliverables.

"So that's one hat – this is project leader. So I'm responsible for delivering the projects." (M21)

The focus on project delivery was a feature of the work of women who, by title, were project managers, but also those who had broader roles:

"There is the more what you might call 'day-to-day' business management type role which is focused on project delivery." (P2)

It was not uncommon for multiple projects to be running in parallel, requiring a high level of coordination:

"So we could have, as I mentioned, six different projects going on at each time, each with their own design team lead." (M3)

Some women managed other project managers, taking responsibility for assurance and reporting on all projects within their section of the company:

"We're responsible for signing off all the projects each month and we do project management along with the reporting. So my team are project managers, but then I'm usually the project director." (M16)

5.3.1.4 Technical

Engineering is a technical profession, applying scientific and mathematical principles to provide solutions. As women moved into managerial and leadership

roles, the emphasis on technical work diminished as their roles expanded to encompass other aspects. However, it did not disappear and technical work remained an important dimension of manager and leader roles. This occurred through continuing to do technical work, providing technical expertise or applying technical knowledge to other aspects of their role such as business development and sales, or team development.

The continued link to technical work was a strong theme and is further explored in Chapter 6. In this section, data relevant to the technical aspects of the managerial role are presented to give a clear description of the complex nature of the managerial role in engineering.

Doing Technical Work and Providing Technical Expertise

Despite having moved into roles that were labelled as manager, several of the women also performed technical work in addition to their managerial tasks. As one participant explained:

"I do have some technical roles as well – I have to run projects, interface with clients, set other people's tasks, review and check the work." (M1)

The 'doing of technical work' was particularly prevalent in the managerial and leadership roles of women working within engineering consultancies or for those occupying Lead Engineer roles. These women managers performed technical assurance, provided expert advice and 'chipped in' and did the work when deadlines were pressing.

One Team Leader explained her technical assurance role:

"I suppose probably my core role is risk management of the advice we are giving because technical advice... there's no standards that reference it. We are a knowledge based group." (M19)

She explained how she took on technical work in times of high workload:

"Respondent: I'll end up taking peaks in workload and work far too many hours."

Interviewer: So in addition to having to run the team you also absorb technical work?

Respondent: Oh yeah, yeah and I do technical reviews of other people's work." (M19)

Another described how the allocation of work to her group was limited by her level of technical expertise. She held the highest level of technical expertise in her office and was responsible for the approval of engineering drawings exiting her office:

"The construction sign off is completely based on my capabilities, therefore I have got to sign them off all of them." (M17)

Team Development

In addition to providing technical expertise and assurance on projects, many women were responsible for or played an important role in the technical development of their team members. One team leader expressed her sense of responsibility for the development of technical knowledge within her team. She explained the investment that she and her organisation made in her staff:

"Because there is no training for people in our area, they have come from other career backgrounds and the graduates; we invest an awful lot of energy to get where we need them." (M19)

Technical Knowledge and Business Development

Technical work was also manifested in descriptions of marketing, sales and tendering activities in the engineering context. Engineering organisations providing technical services or capability to other organisations rely on the technical expertise and experience of senior team members in seeking out and securing work. One participant spoke of the business development responsibilities of her role:

“As part of my role as an executive, I have the business development role which um, probably takes up about half of my time... so that is looking at really long-term opportunities, working with new... trying to find new clients and new opportunities.” (P2)

Business development activities are highly relational, requiring relationship building and communication, but the ability to identify opportunities for potential work, correctly scope and quote for such work, allocate the appropriate team members to and communicate and build relationships with potential clients requires a level of technical expertise consistent with high professional qualification and experience.

5.3.1.5 Manager and Leader in Engineering – a Holistic Role

The collective view of the participants indicates that the purpose of a manager and leader in the engineer profession is to deliver a capability – whether that be providing specific engineering services or delivering projects. The women perform complex and multi-faceted roles, comprising relational, organisational and technical aspects, to achieve this. One participant described her role as “holistic” (M9) with each aspect being inseparable from the others and required to successfully perform her role. While all tasks were important, there was particular emphasis on the relational aspects of the role, including responsibility for others, relationships with others and communication.

Despite querying women engineers’ advancement to management and leadership, direct references to leading or leadership were not common in the women’s accounts. Implicit references to leadership through the emphasis on relational tasks could indicate that management and leadership were considered by the participants to be concurrent and synchronous aspects of their more senior organisational roles.

5.3.2 Perceptions of Other Manager / Leaders in Engineering

In addition to rich details about their own managerial and leadership roles, the women offered observations and reflections about other managers and leaders

in their profession. They described the skills required to be an effective manager or leader, and the behaviours and qualities of these managers and leaders. For most participants, these observations were about male colleagues. This highlights that women engineers learn about who a manager and leader is and of what is desirable and accepted in a manager and leader from male role models.

5.3.2.1 Required Skills

The women expressed a clear view of the skills required to be an effective manager and leader: a combination of commercial, technical and interpersonal acumen. The importance of business and industry understanding, and commercial focus was reiterated by several participants:

“Most of them spend most of their time focusing on commercial stuff and not engineering stuff.” (M2)

“Has a very good understanding of the client’s business. A good understanding of the market - so the economics of the business as well as the technical side of the business.” (P3)

They also highlighted the importance of interpersonal skills such as the ability to build relationships and communicate well with others:

“He was a great leader of people, had very good people skills and communications skills.” (M12)

The gravitas placed on interpersonal skills was particularly evident when the participants described managers that they did not admire or viewed as ineffective:

“Some of these client managers just don’t seem to understand that you’ve got to build a relationship and if we are going to win work it has to be built on trust and confidence in our ability to deliver.” (M3)

There was less emphasis placed on technical acumen. One woman described her perception of a good manager as being:

“very commercially focused, very much managing staff, very little technical input at all.” (M2)

Some women made comment about the detailed nature of engineers, a stereotype that made them unsuitable for management in the eyes of others.

“Some people that are very good technically don’t have any of the skills that are required for management. They don’t have people skills, they can’t communicate, they can’t do the budgeting and planning that is required and so they’re not good managers.” (M5)

“You get sometimes put into a position as a manager because you’ve had the technical experience and therefore you are the best person from a technical perspective, but sometimes they are the worst person to manage a team or guide a team and lead a team and motivate a team, you know, in spite of the budget perspective and the technical side of it.” (M13)

Others saw the benefit that technical and process oriented engineering background could bring to a management position. One woman spoke of a previous Managing Director that she had worked for:

“He was a civil engineer, and he became the CEO of the organisation, and he was very analytic, process driven, but could also make broader decisions.” (M5)

The combination of commercial, interpersonal and to a lesser extent technical skills were perceived as necessary to achieve the purpose of management and leadership within technical organisations.

5.3.2.2 Behaviours

The move to a managerial or leadership position was associated with a change in focus, described by one woman as *“moving away from the tactical coal-face”* (M11). Another participant described a successful manager in her department as focusing on the business – working on it, rather than in it:

"I think actually part of it comes back to he's not doing project work any longer and so he's spending all his focus on what he's meant to be doing, working on the business." (M16)

The change in focus was accompanied by taking on responsibility for the business and for the people within it. One manager expressed that this responsibility extended to an obligation to nurture and protect the business, through developing people and recruiting new staff.

"Within (Organisation), there is very much a feeling of we have to nurture the business for future generations... so there is that identification of people who will be the future leaders and so on. And nurturing people through that and finding, likewise, finding the best people to bring into the business and people who would fit into the business." (P2)

People in these roles were also expected to visibly demonstrate leadership. The form of visible leadership varied. Managers and leaders were seen to need the ability to make hard decisions and to instigate and manage change when required. Particular to the military, visible leadership was seen as taking command and telling others what to do.

"Making those hard decisions. Even when you [laughs] can get a bit of backlash for it." (P2)

Still others saw leadership as requiring influencing behaviours:

"Leadership is about influencing and getting people to buy in to ownership of a problem. And getting buy-in, and then getting commitment to fix it, as opposed to just sitting there, waiting for some fairies at the bottom of the garden to come along and either remove your problems, or expecting the problems would just go away, you know. And they never do. They never do." (M11)

5.3.2.3 Qualities

The participants described several qualities of managers and leaders within their profession. Qualities differ from behaviours in that they describe the attributes

and characteristics of managers and leaders as they appear to others, rather than their actions (Horner, 1997).

Qualities such as commitment, loyalty and dependability were highlighted in the data.

"She is very committed to building the business // She's very loyal." (M3)

"if he says he's going to do something, then he will." (M16)

Some women described managers and leaders that could influence the behaviours of others, and to get the best out of their people.

"I think the extent to which they can get people's commitment and discretionary effort and results and business outcomes... and 'look at this, what a fantastic team, they run a really tight shop'". (M4)

For one woman, the ability to motivate and influence depended on presence and personality, describing a manager whom she did not view as effective as:

"a bloke I worked for as a [commissioned rank], he was my CO, he was a [commissioned rank], extremely competent officer. In terms of his staff work, in terms of his ability to make decisions, fantastic, but he doesn't have a presence. He now salutes me, which is kind of embarrassing. He's never done anything wrong. He's great, but he just doesn't have that personality." (M10)

5.4 Chapter Summary

This chapter has presented a demographic profile of the study participants. The concept of a manager and leader in the engineering profession was explored, drawing on reflections upon the participant's own managerial and leadership roles and their observations of other managers and leaders in their profession.

Women engineers described complex and multi-faceted roles, characterised by relational, organisational and technical tasks. They associate these roles with the clear purpose of delivering a capability, which they achieve by employing a highly

relational approach with a focus on responsibility for and relations with others in the organisation. There was a continued connection to and performance of technical work, despite occupying management and leadership roles.

The women's observations of other, predominantly male, managers and leaders in their profession revealed they perceived that effective managers and leaders combined commercial, interpersonal and technical acumen to fulfil their roles. Becoming a manager and leader involved a shift in focus from "in the business" to "on the business", and assuming responsibility and care for the business and its people. Good managers and leader demonstrated visible leadership, through the making of hard decisions, making and managing change and in some contexts 'taking charge'. They were loyal, committed and dependable, and able to motivate and influence others through their strong interpersonal skills.

The combination of reflection upon their own experiences and observations of others allows an alternative conceptualisation of a manager and leader in engineering, the expectations that women place on themselves and on others within their profession to emerge.

Equipped with an understanding of the women's perception of managers and leaders in engineering, Chapter 6 moves to the women's transition experiences. The next chapter presents a portrait of the experience of transition to manager and leader for women engineers, drawing on key themes that emerged from data analysis.

6 Women's Experience of the Transition from Engineer to Manager and Leader

6.1 Introduction

This chapter continues the presentation of the findings from interviews with 22 women engineers in Australia. It focuses on the major findings relevant to the participant's experiences of transition from engineer to manager and leader. In line with the phenomenological and feminist perspectives that informed the research design, this chapter provides a portrait of the experience of transition for women engineers, highlighting common elements and points of difference. The findings describe what the participants experienced as they made their transitions from engineer to manager and leader: the foundations and reasons for their transition, the changes and challenges that accompanied their new role, and the ways in which the women reacted and adapted to these.

Van Manen (1990) highlights that there are alternative ways of structuring and presenting research findings, suggesting "to organize one's writing in a manner related to the fundamental structure of the phenomenon itself" (p. 168). This chapter adopts this approach. Interviews conducted with women engineers provided an account of each woman's unique journey to managerial and leadership roles within the engineering profession. Key themes that emerged from data analysis are considered as "knots in the webs of our experiences, around which certain lived experiences are spun" (ibid, p. 90), facilitating description and interpretation of the phenomenon. Given the temporal nature and structure of transition, this description and interpretation is organised against a temporal framework.

The chapter begins with an overview of the ten phenomenological themes that emerged from data analysis. Then, the phases of transition generated by reflection upon the temporal nature of the women's transition experiences are described. Women's experiences of the transition journey are then discussed against this temporal framework, under the headings of 'Getting Started', 'Making

a Move', 'Encountering Change and Challenge', 'Negotiating the Environment' and 'Resolving and Reconceptualising'.

6.2 Phenomenological Themes

Through seeking to interpret and understand a lived experience, phenomenological themes attempt to capture the “structures of experience” (Van Manen, 1990, p. 79) or elements that constitute the lived experience being studied. Women’s experience of transition from engineer to manager and leader is described by key themes from the phenomenological analysis of the interview data. The themes that emerged were:

1. Individual Qualities, Abilities and Preferences
2. Intrinsic and Extrinsic Motivations
3. Influential Relationships
4. Relational Perceptions and Attitudes
5. Building Knowledge and Skill
6. The Organisation
7. Pathways to Manager and Leader
8. Influence of Gender on Career and Advancement
9. The Technical Link
10. Impact of Transition on Self

The definition of each phenomenological themes is included in Appendix G and a map of the categories and sub-categories included in each theme are included in Appendix H.

Reflection on the interrelation of these themes, informed by phenomenological reduction and reflection techniques (Van Manen, 1990), led to the grouping of themes into three core categories:

- Individual: themes relating to a participant’s personality, characteristics, motivations and agency
- Relational: themes relating to the influence of other people on the women’s transition experience

- Structural: themes relating to the influence of the organisation, the engineering profession and broader society on the women's transition experience

A description of these groupings and their interface with the ten phenomenological themes are presented in Appendix I.

6.3 The Transition Journey

The phenomenon of transition to manager and leader explored in this study emerged as a dynamic and multi-staged journey. Analysis of the women's accounts revealed that their experience of transition extended well beyond the confines of a move from one work role to another. In addition to the themes developed through phenomenological interpretation of the data, reflection upon the temporal nature of transition experience generated a series of transition stages. These were largely chronological, however the occurrence, sequence and duration of the phases varied between participants and the phases were not always clearly delineated.

The phases of the transition journey emerged as 'Getting Started', 'Making a Move', 'Encountering Change and Challenge', 'Negotiating the Environment', and 'Resolving and Reconceptualising'. The transition phases are illustrated in Figure 6.1:



Figure 6.1 - The Phases of Transition

Reflecting upon the data using a temporal framework in addition to identifying phenomenological themes provided a deeper understanding of how women engineers transition into managers and leaders in technical organisations. Each transition phase was informed by aspects of the three core categories presented in section 6.2.

‘Getting Started’ focuses on the influences active prior to the first managerial / leadership appointment. The preparation for a move to manager began in early career, well before seeking or being offered a managerial opportunity. The process of ‘Getting Started’ includes self-awareness of their traits, strengths and preferences, and enhancing confidence and self-efficacy through the gathering of experience and accumulation of technical engineering knowledge. A strong grounding in engineering work enabled the women to establish credibility and become visible in their organisation, and to establish key supportive and guiding relationships. The gendered nature of the engineering workplace is visible from early career; it is recognised but its influence on achievement and career progress is contested. This phase is described in section 6.4.

The opportunities, triggers and decision to make a move to the first manager/leader position, that is **‘Making a Move’** are explained in section 6.5. The decision to move away from a technical engineering role to a management or leadership role is influenced by intrinsic and extrinsic motivations and the presence of opportunity. Opportunities for ‘making a move’ were frequently facilitated by the organisation and others within the organisation rather than initiated by the women themselves. Hard work and merit, and networks and work-related relationships become antidotes to obstructive, frequently gendered, elements.

As the women moved into their new role, they found themselves **‘Encountering Change and Challenge’**. This is discussed in section 6.6. ‘Encountering Change and Challenge’ describes the new dynamics, responsibilities and expectations that accompany the change in organisational role. These include changes to relationship dynamics resulting from repositioning within the organisational hierarchy, increased ambiguity and complexity that accompanied new responsibilities, the move away from individual worker status and the tensions generated by a continued connection to technical work. Several factors, including motherhood, added an additional layer of change and challenge and acted to interrupt or impact on the transition for some women. Many women noted an increased awareness of gender differences and restrictive attitudes in this phase of their transition.

‘Negotiating the Environment’ explains how the women react and adjust to the many changes and challenges encountered upon moving in to their new roles. This is the focus of section 6.7. In this phase, individual resources are important to managing the transition. The focus of this phase is the relational approach adopted by the women. Great emphasis is placed on building and using relationships to assist their transition. Relational constructs such as credibility and reputation reappear as mechanisms for negotiating new relationship dynamics. Acceptance and positive feedback from others validates the move. Access to other’s expertise is also relational, albeit conditional on adopting a humble attitude and deferential power position.

The organisation plays a less dominant role in this phase. The meaning attached to organisational hierarchy, title and qualifications are symbolic of transition to others within the organisation. Challenges emerging from the gendered nature of engineering work place are negotiated using a blend of practices that both suppress and embrace aspects of the women’s gender. While organisational policies are perceived to facilitate women’s continued participation in the workforce; in some organisations the same policies hinder continued career progress and advancement. Resulting ‘interruptions’ to transition are managed through by oscillating between technical and managerial roles, made possible through the active retention of technical expertise.

This move to a managerial role did not signal the culmination of the transition to manager and leader. Becoming a manager is revealed as an external transition to a role or series of roles, accompanied by an internal journey of adjustment and developing self-perception. These external and internal dimensions are frequently misaligned. The choices made by the participants and their identification as managers, leaders or engineers were shaped by a desire to re-align with individual preferences and strengths, reinforced by validation and a sense of belonging, and bounded by professional and organisational norms as well as their own and others gendered expectations. The internal journey that accompanied the women’s move to managerial roles and culmination of the transition is conceptualised as **‘Resolving and Reconceptualising’** and is explored in section 6.8.

6.4 Getting Started

The transition from engineer to manager and leader commences well before seeking or being offered an opportunity to move into a managerial or leadership role. This was evident from the women's discussions of their careers and the care that the women took to explain the context and experiences prior to their transition to manager / leader. Whilst I asked a general question regarding the women's careers to date, this was not the focus of the interviews and level of detail provided about early career influences was surprising, suggesting that for some at least, career transitions have long lead times. This section provides a summary of the key influences that acted as a foundation to the transition to manager and leader.

6.4.1 The Foundations of Transition

Analysis of the experiences of women engineers revealed a range of elements that provided a foundation for their transition and influenced their initial move to a managerial role. These can be broadly grouped as shown in Figure 6.2 as: i) individual attributes and motivations, ii) expertise and skills, and iii) interpersonal factors. While the interplay between these three elements can vary, it appears that it is their combination that lays the foundation.

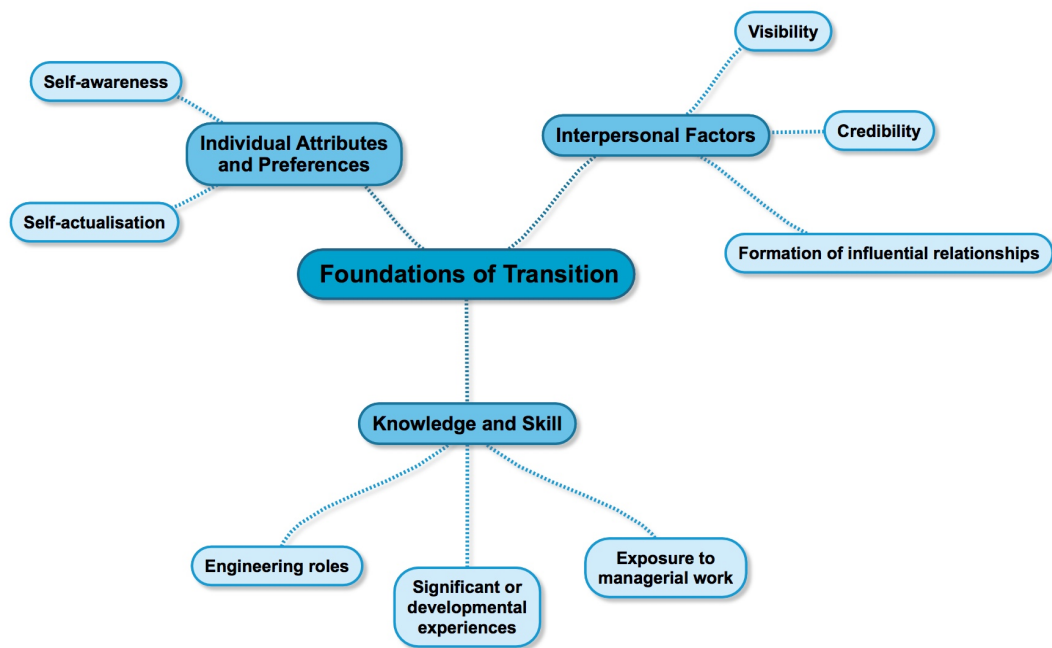


Figure 6.2 - Foundations of Transition

A woman's transition from engineer to manager and leader was influenced by her individual characteristics, abilities and preferences. For some women, there were aspects of personality, her innate preferences and abilities that steered her towards a management role. Self-awareness of these qualities and the desire to find a career role that was congruent with them, or enabled them to express or exercise their preferences appeared to be key.

Common to some was an interest in broader roles and perceived value of non-technical skills. One engineer working in the oil and gas sector explained:

"I didn't ever see myself as purely technical, no. I always thought that my skills were broader and I could bring more to the profession than just technical skill. And I was interested in more than that". (M4)

While the women's characteristics and preferences are interesting in themselves, they are particularly relevant for demonstrating an awareness of personal characteristics and preferences and the links these may have with future advancement into managerial / leadership roles. In many cases, self-awareness of personal characteristics and preferences underlay the decision to pursue or

accept a management or leadership role. This self-awareness combined with the agitation of ambition and curiosity lead the women to the pursuit of self-actualisation, or the desire to seek a role that allowed expression of these characteristics and fulfilment of their preferences.

Women prepared themselves for the transition by building knowledge and skill. They did this through engineering roles, developmental experiences and exposure to managerial work. Most women started their careers in purely technical engineering roles, or, in the case of women in the military, roles with a combination of technical and managerial aspects. Engineering roles enabled them to build technical, professional and industry specific knowledge.

Work experiences in early career were influential on women's later career decisions and opportunities. Some women described early roles as "significant" or "developmental". They perceived these experiences as having shaped their transition. Developmental experiences included overseas postings, site work, challenging assignments and working through a variety of roles that developed skills in the technical realm and beyond. Career reflections revealed that significant development opportunities were sometimes missed and only realised in retrospect.

Many women gained exposure to managerial work prior to their decision to move to a managerial or leadership role. Roles in which they were second in charge (2IC), instances in which they themselves were "doing the job anyway", and small managerial roles enabled sampling of and exposure to management work.

Accumulating knowledge and experience built confidence and self-validation. This was important in the women's readiness to pursue senior roles and their perceived ability to enact them. It was also important for the women to establish credibility and visibility within the workplace. Establishing credibility and visibility was achieved through technical and practical engineering experience, which was perceived as an essential foundation for becoming a manager in engineering related organisations by many of the participants. Technical and

practical grounding was described as important for managers and leaders in engineering generally, for women engineers it had a differential impact.

Linked to credibility and reputation, visibility, or being known, noticed or seen by others within the organisation was also prominent in the experience of advancing to senior roles. Several women stressed the importance of being visible within the company, as other people in the organisation were often the instigators, facilitators and gate-keepers of advancement opportunities. This was particularly the case in large organisations. These relational aspects created opportunity for advancement and formed a basis for team relationships during the transition.

Relationships with superiors were influential. Those in more senior positions acted as gate-keepers either facilitating or creating an obstacle to transition. Some women felt that a good relationship with their superiors enabled them to demonstrate their abilities. Others expressed concern that poor relationships or conflict served to limit their career prospects.

"He saw me, and he says, "Oh and how's Girlie?" in this really horrible, derogatory voice. Now, he was a manager at this point. And I just saw red. And I happened to have a specification in my hand that was about an inch thick. It was just, I forgot about the bulldog clip on the end, and I had it in my hand, and I went whack over his head! He never, ever called me Girlie again. Then for a couple of weeks after that, every time he saw me he put his hard hat on! But I've never got on, you see. I sort of put an end to my career, in a way." (M8)

Early career was a time of developing relationships that become important in subsequent stages of the transition. Key guiding and supporting relationships such as mentors and coaches were established during this time, but were not commonly used prior to the transition.

As women advanced in their engineering careers, they followed a variety of pathways. The transition beyond the technical role occurred at different times in the women's careers and following a range of experiences. Three career shapes illustrating the timing and prior experiences that emerged from the data are

shown in Figure 6.3. A common thread linking the three career shapes was a sense of movement generated by variety and change – between sections of an organisation, from one organisation to another, from site to office based roles, or geographical locations.

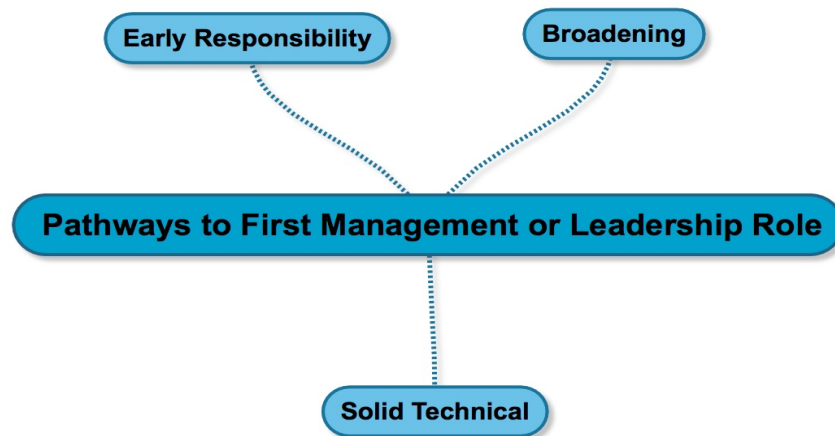


Figure 6.3 - Pathways to First Management / Leadership Role

Some women were observed to move to their first managerial role early in their careers – labelled ‘early responsibility’. An early transition was typically driven by organisational policy or culture (see section 6.5.3). Others moved into a managerial role much later in their careers following a steady accumulation of experience. For some women in this group, the early career had a ‘solid technical’ focus. For others, the early career was characterised by ‘broadening’, or working through a variety of different roles that had a technical aspect, but not a technical focus.

6.4.2 The Contested Influence of Gender

From the beginnings of their careers women engineers experienced interactions and relationships in the workplace coloured by gendered roles, stereotypes and heightened visibility. The contested influence of gender on women’s advancement is summarised in Figure 6.4.

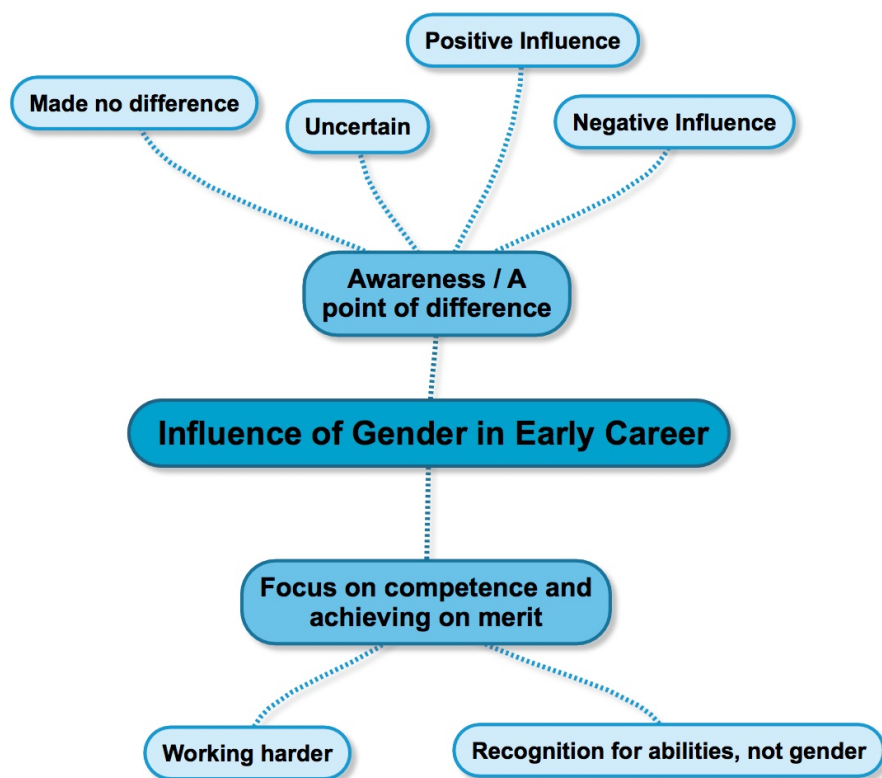


Figure 6.4 - Influence of Gender in Early Career

Gender was acknowledged by most women as a point of difference. From early career, the women were aware of their gender, however its impact was contested. Some women felt that their gender did make a difference to their careers, experiencing early career as a “hard road” or a “steeper curve” than their male counterparts. Descriptions of paternalistic relationships with a ‘father - grandfather - daughter’ dynamic were common and were perceived to facilitate career progression although the cost of this on overall career success was questioned by some. Others felt that their gender made no difference or were uncertain and questioning of its impact on their early careers.

Regardless of the perceived influence of gender in early career, the data revealed a common focus on achieving competence and merit, and of wanting to be measured by this. The reaction by many of the participants to tempered opportunity and differential treatment was to prove competence and capability by working harder. One woman speaks of “*working very tirelessly*” (M8) in early roles.

One participant had a strong desire to be recognised for her abilities, rather than her being female:

"You'll note that I don't wear makeup. I noticed when I first went out as a trainee, that that created a different response. I didn't want to be treated as a girl, I wanted to be treated in a way that respected what I had to say, not for how I looked." (M9)

The perceived need to prove competence and capability by working harder, and accepting and adaptive behaviours, indicate that regardless of the degree of acknowledgement gender did have an impact from early career.

"I mean, we could sit here and talk about the bad things that happen to you, but I think that there are things that you remember and frustrations, but the better things, the good things definitely outweigh that and I think if I was still harbouring that resentment from little barriers you get - I mean every career will have that, it doesn't matter what gender you are or what." (M12)

6.4.3 Getting Started - Summary

The foundations of the women's transition to manager and leader were established in early career. Self-awareness of personality, preferences and abilities steered the women toward managerial roles. Early career was dynamic, characterised by movement through a variety of roles, work locations and organisations. Early roles enabled the women to accumulate knowledge and skill. While of value in itself, knowledge influenced the women's confidence and self-efficacy. It also enabled them to establish credibility, enhance their visibility within the workplace and found relationships that became important as their transition progressed.

The women's transitions commenced within the gendered context of the engineering workplace. This was evidenced by descriptions of their workplace interactions and relationships, and through their emphasis on hard work, achieving competence and being measured by merit. While gender was

recognised as a point of difference by most women, the influence of gender and the gendered work context at this stage of transition was contested.

6.5 Making a Move

The participants' careers are marked by a decision to seek out or accept an offer of promotion away from a purely technical engineering role. This career move is influenced by the women's motivations, relationships with others, and organisational factors. The influences informing this stage of the transition are presented in Figure 6.5:

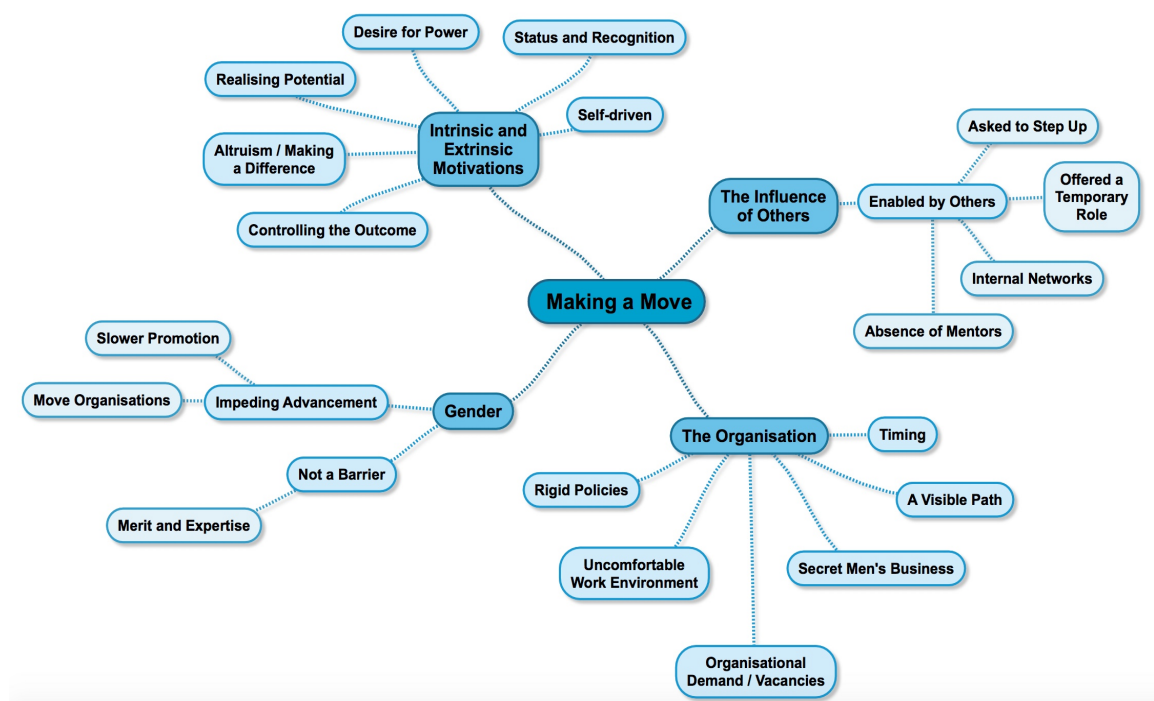


Figure 6.5 - Making a Move: Influencing Factors

6.5.1 Intrinsic and Extrinsic Motivations

Deciding to seek out or take a managerial leadership role relates to fulfilling individual desires. The data allow the identification of five motives that appear closely linked with the decision of women in this study to transition to senior roles. These motivations were self-actualisation, a desire for power, influence and

control, status and recognition, altruism, and being self-driven. For most women, a number of these motives were in play.

6.5.1.1 *"I really want to realise my potential" (M5)*

Data in this category capture discussions relating to their desire to work at a senior level because participants' felt that they had unrealised potential. The opportunity to take a certain role or being offered a position at a managerial level was of importance to them.

"I really want to realise my potential." (M5)

For some, moving to management was driven by a sense of dissatisfaction, boredom and under-utilisation in their technical role or a desire for wider responsibility.

"I just felt so underutilised... using a very small part of my skill set, as a design engineer." (M21)

A motivation for transition to manager can be seen as a form of self-actualisation that is the desire to fulfil their potential.

6.5.1.2 *"I'm interested in power!" (P2)*

A desire for authority or positions of influence was a strong motivating factor. This was linked to having autonomy in their own decisions and influence and impact at the organisational level. One participant captured this succinctly stating:

"The power! I'm interested in power!"

I think I have a very strong desire to... be independent... and that's not necessarily wanting to work on my own, but being able to make decisions myself." (P2)

Having influence on the wider organisation was also important. The channel for achieving this was perceived to be through organisational roles with formal management or leadership status.

“People don’t go into management for the sake of management. I thrive on having the responsibility and the authority to make decisions.” (M12)

6.5.1.3 *“The position and the recognition” (M12)*

Acknowledgement and recognition by way of a formal organisation role with a job title was important to some women.

“My boss... he retired, and that was an opportunity to gain the position and the recognition for the work that I’d been doing without having a shadow over it.” (M12)

Others were drawn to the status of management positions and perceived that management positions commanded a greater level of respect both inside and outside of the workplace.

“I always completely floor them when I actually say what I do. // They think you’re a housewife or whatever...” (M21)

Recognition in itself was not necessarily of value to all participants, but a formal organisational role was acknowledged as necessary for navigating the organisation and for achieving their objectives through influence and impact.

“I don’t personally think that it’s super important but I think from surviving in an organisation point of view I think it is important. [Company Name] tend to be fairly flat hierarchy-wise but there is definitely status associated with different levels and so on.” (M3)

6.5.1.4 *“A deep desire to change things” (M11)*

A further motivation was altruistic desire. One woman explained that she was motivated by her interest in helping others achieve their best.

"I like getting the best out of people and encouraging them // I do it because I am genuinely interested in what people want to achieve for themselves..." (P2)

Other women were driven to advance by wanting to make a difference at the organisational level. This motivation echoes the desire for influence noted in section 6.5.1.2.

"What did I decide to play in that space? What drove me on? // Probably actually a deep desire to change things." (M11)

6.5.1.5 *"I look for it, I fight for it" (M20)*

Most women in this study can be described as self-driven. The data indicate that they possessed high levels of motivation to achieve in their careers and aspired to more senior roles.

"I am in this level because I look for it, I fight for it. I still keep looking for better [management positions] or I want to go further in my life." (M20)

Some women changed their situation if opportunities were not available in their organisation.

"I haven't wallowed in self-pity or a feeling of the whole world is against me. It's been a case of 'ok, stuff you, I'm off. I'm going to go and do something else'." (P2)

While the women in this study were ambitious and desirous of career success, it was unusual for the women to nominate themselves for their initial management role. For most women, the opportunity to move into a managerial role was enabled by others within the organisation.

The experience of one woman was a notable exception. She was motivated to move toward her first management role out of frustration. There was a sense of wanting to control workplace outcomes rather than be at other's behest.

"I asked to take on this role because I didn't like the alternatives. It wasn't the role that was appealing, it was not wanting to work for some of the other people." (P1)

6.5.1.6 *"I felt as if I couldn't say no" (M21)*

A small number of the participants expressed reluctance at the role change. The move to manager was viewed as an inevitable and unavoidable career progression and a consequence of increasing expertise.

"I took over the team, I felt as if I couldn't say no. I didn't actually want to take over the team at the time." (M21)

6.5.2 *Enabled by Others*

Whilst some women self-initiated their move to management, it was more common for management opportunities to be facilitated by influential internal and external contacts. Women were identified as individuals with the potential for a managerial role and were approached to fill such positions.

"I was seen as someone who could help supervise then start to move into the more lead engineer role / study manager, to becoming a lead engineer on FEED projects, then becoming the Function Manager." (M1)

6.5.2.1 *"I was asked to step up" (M3)*

Several women stepped up into a managerial role within the section of the organisation that they were working in. Most commonly the move to an initial managerial role was achieved through a process of what could be considered or seen as natural career progression within one organisation. Some became manager of their existing team upon departure of an incumbent manager or the growth of a function or team:

"when the [speciality] manager left – I was asked to step up as a combined [function] engineer and [speciality] practitioner to fulfil those two roles." (M3)

Others moved to managerial roles on new ventures or projects within their same organisation, with opportunities created by the project based nature frequently observed in engineering work.

A small number of women moved organisations. One woman explained that she had applied for a role in a new organisation corresponding to her current level, and was offered a higher managerial role instead:

"I sent an email to the HR Manager out of the blue asking if I could come and work there. I just wanted to be able to practise what I had been doing, just as I had done as a specialist but when they interviewed me they thought that I could set up a team." (M19)

6.5.2.2 *"Could you do the manager's job, just temporarily..." (M18)*

Another mode of progression was the temporary position created by the illness of a manager, an overseas move or retirement. A small number of women were offered a temporary management role while recruitment functions endeavoured to find a permanent replacement. However, some of these offers had conditions such as working fulltime attached.

"My current manager at that time had won a position elsewhere in the department and the director, asked me at the time, he said "Could you do the manager's job, just temporarily while we try to fill the position? You would need to work fulltime." (M18)

For two of these women, the temporary role became permanent, while the third woman returned to work within the team for a short time.

"my boss was going on leave for a month and they needed someone to take over the project whilst he was away, so I took over that. I thoroughly enjoyed it...When he came back it was running great, thank you very much, and he didn't take it back over." (M21)

6.5.2.3 *“I didn’t go to a boy’s school” (M8)*

The importance of establishing and nurturing a network within their organisation was emphasised. Internal networks had a bearing on promotion and opportunity.

“It’s still very much about who you know as to how you get promoted. You know, you’ve got the school tie network, which of course, I don’t, because I didn’t go to a boy’s school.” (M8)

In the absence of ‘school-tie’ networks, purposeful effort was required to build internal networks. This included identifying people they wanted in their networks, building relationships through meetings or lunch dates, and gaining exposure at work through particular roles or projects. Additional effort was required by women who were located outside of the corporate office, for example those located in project offices or seconded into client premises.

“Since January this year, I’ve been officially back in the office here and that’s been really good for building the internal networks.” (M3)

External networks also played an important role in their transition and were a source of opportunity for some.

“I happened to bump into someone that I used to work for, hadn’t seen him in years, I bumped into him. It was like ‘hi, how are you going...’ and the next thing I knew, he’d actually put my name forward to [Organisation] because he knew they were looking for an Associate.” (P2)

6.5.2.4 *“To have had a mentor... would have been fantastic” (M8)*

It was not common for women to draw on mentoring relationships at the time of seeking out or accepting an offer of promotion away from a purely technical engineering role. Rather, the value of mentoring was frequently realised in later career. Several women spoke of wishing that they had had mentors at the commencement of their transition or recommended developing such a relationship to others following in their footsteps.

"It was always the secret business. So, to have had a mentor that sort of said, 'Well, these are the sort of things that they're looking for, for you to demonstrate that you can do, so that we can see your management material,' would have been fantastic. But nobody ever told you that. It's a case of, you had to try and figure it out." (M8)

6.5.3 Organisational Elements

Elements of the organisation including organisational structure, policies and processes and the workplace culture influenced the move to a managerial role. The participants commonly viewed their organisation as a facilitator of transition or a source of opportunity, and less frequently as a constraint to their advancement.

6.5.3.1 *"They put you in these positions very quickly" (M2)*

Organisational policy and workplace behavioural norms resulted in some women assuming managerial positions in early career. A project manager explained that her initial move was influenced by the organisation's policy of placing young professional engineers into supervisory roles and its "sink or swim" culture. This was viewed in a positive light by this woman.

"Yeah, it was very early. Company A were good like that. Company A were very much a sink or swim company... as a result they put you in these positions very quickly." (M2)

Women engineers in the military worked also in management roles from early in their careers. The organisation's highly structured hierarchy and explicit expectations and responsibilities for roles at each level of the hierarchy facilitated this. During the interview with one military woman, I expressed my surprise at the level of responsibility expected of and afforded to her at early stages of her career:

"Interviewer: That's amazing, that sort of responsibility very early in the career.

Respondent: ...that's just what we did, I didn't know any different." (M9)

6.5.3.2 “A bit of a well-worn path” (M4)

Several women spoke of the visibility of the path leading to managerial roles within their organisation. In some organisations, particularly the military, there were highly structured and defined promotion processes and pathways. In other organisations a typical or “well-worn path” for engineers to reach roles with a wider responsibility was noted. Some women couldn’t recognise a clear pathway, and their experiences are discussed in the following sections.

Military women spoke at length about the highly structured nature of their promotion process. The criteria for moving from rank to rank was well defined. Initially time-dependent, the process for moving to higher ranks becomes competitive and was based on annual performance appraisals covering current job performance, potential ability to fulfil the requirements of higher ranks, and leadership potential. A board of superiors made promotion decisions:

“A board of members two ranks senior to us sit around a table and read all of our reports, and compare us and rank us.” (M9)

A unique feature of the military promotion process was the structured approach to moving into senior leadership roles. The transition to manager and leader within the organisation is defined by the attendance of a particular course. This approach is both symbolic for the rest of the organisation, and also clearly marks the transition for the individual. As one military woman explained:

“It’s the point where you really exit the tactical domain and where you step away from being men and women of action into men and women of reflection.” (M11)

Women outside of the military environment rarely mentioned structured promotion processes. Women working in large corporations with a partnership or employee ownership structure described the link between managerial responsibility and partnership hierarchy. Promotion to the level of Associate was automatically accompanied by a responsibility for a team.

“Basically, once you are promoted to Associate, you are then responsible normally for a group of people.” (M8)

For others, pathways to managerial roles were only made visible by observing the choices and opportunities taken by others.

“It was generally, a bit of a well-worn path for engineers to becoming managers. So they’d go from technical into supply, then do a stint in [Interstate City] and come back to [Interstate City] and kind of take up a management role. Maybe with some steps in between. // I kind of saw this as a bit of a path for myself.” (M4)

6.5.3.3 “Secret men’s business” (M8)

Though the pathway to management is highly visible and organised in many organisations, the process of getting onto that pathway can be opaque and mysterious. A small number of women verbalised the lack of transparency of the promotion process.

“It was all a bit like secret men’s business. You know, how do you get from being an engineer here to an Associate here, which really, as far as, you know, there was no transparency whatsoever as to how you go from A to B. And it was all in this secret squirrel business, is what it felt like, to not know.” (M8)

The lack of a visible or structured path, or transparency in promotion, highlights the influence of others on women’s advancement described in section 6.5.2. In these cases, women were forced to rely on networks to access promotion opportunities.

6.5.3.4 “They’re not even sitting a promotion board this year” (M10)

The opportunity to be promoted to a certain level within the organisation may depend on there being a vacancy at that level - that is, a level of demand. This was particularly relevant, but not exclusive to, the military setting. An organisation’s human resource structure may dictate the number of positions available at a

certain level. The ability to reach this level, irrespective of capability or desire, may be constrained by this. One military woman explained:

“Promotion from [commissioned rank 1] to [commissioned rank 2] has slowed to the point where they’re not even sitting a promotion board this year for engineers.” (M10)

For military women in particular, promotion was time-sensitive and a ‘window’ for promotion existed. Spending too many years at one level within the organisation could limit the opportunities to progress to higher hierarchical levels. The same women explained the time-sensitivity of promotion within her organisation:

“I think I was promoted from [commissioned rank 1] to [commissioned rank 2] at about the six year mark, it would have been close to it. Oh gees, I can’t remember but it would have been close to it. That’s when you’re really in the zone. These guys, you’ve got eight, nine year [commissioned rank 1] that know they’ve got no hope.” (M10)

6.5.3.5 “Get me out of this Dilbert cartoon” (P2)

Some women felt that their advancement was inhibited by the organisation’s rigid policies or uncomfortable work environments. One woman compared her workplace to “*living in a Dilbert cartoon*”¹¹. While the environment was not hostile, this woman felt that her advancement was curtailed by a workplace that she perceived to be conservative and backward:

¹¹ Dilbert – a satirical cartoon series started in 1989, written by Scott Adams featuring Dilbert, an engineer, and his pet dog Dogbert. In later years, the comic strip focused on Dilbert’s workplace in Silicon Valley and satirised technology, workplace and organisational issues (Wikipedia, 2017).

“every other week it was like ‘you have got to be kidding me’... We had a male engineer who got a pay rise because he got married. And I thought ‘Geez, I thought this went out in 1960!’” (P2)

Another woman described a more antagonistic work environment.

“It was a place where the culture was one where you shouldn’t really admit mistakes or admit you don’t know something... anyone who asked for help was seen as a blithering idiot.” (M19)

Alignment with the attitudes and values of the organisation appear important to the women in this group. The women that encountered incompatible workplace environments in the time near to their move into managerial roles made the decision to move to another organisation.

“I thought, ‘I can’t fight this any longer... get me out of here’... ‘get me out of this Dilbert cartoon. Anything’s got to be better than this’.” (P2)

6.5.4 The Influence of Gender on Making a Move

Prior to making the move to their first managerial role, the participants described gendered situations and relationships within the workplace and indicated an awareness of their gender, but expressed diverse views as to its effect. The influence of gender remains contested as women move into their initial management roles.

Gender was perceived by most women not to be a barrier to making their move to a managerial role. The focus on hard work, merit and competence that emerged in early career continued as the participants moved toward management roles, against a sustained backdrop of a gendered workplace. Woven throughout the women’s stories are issues relating to merit, their own views of wanting to be selected on merit and observation that others aren’t. However, a small number of women felt that their gender was an impediment to advancement and overcame this by seeking employment elsewhere.

6.5.4.1 *“You were given the role because of the experience” (M13)*

Despite recounting situations that were highly gendered, most participants did not consider their gender to be barrier to advancement. Opportunities for progression to management roles were perceived to be the result of hard work, past experience and the demonstration of technical expertise in early career.

“I think because I had worked on construction sites. It wasn’t “You were given the role because you are female” I think you were given the role because of the experience that I had in the type of work that I did and the roles that I had previously.” (M13)

6.5.4.2 *“I think if I’d been a man, I’d probably be a Principal by now.” (M8)*

A small number of women considered their advancement to be impeded by their gender. One participant deemed that being a woman had slowed her progress. She noticed less experienced and less skilful male colleagues her being promoted before her.

“I think if I’d been a man, I’d probably be a Principal by now.” (M8)

Other women became aware of conservative or antagonistic views within their organisations, or noticed the lack of women in senior management positions. These women described situations that reflected gendered cultures and workplace values and practices that served to propagate and reinforce gendered stereotypes.

They realised that advancement would not be achieved in the existing climate, and were unwilling to continue to fight or challenge the status quo. Opportunities for advancement were quickly located within other organisations.

6.5.5 Making a Move – Summary

Making a move to a managerial role was driven by intrinsic and extrinsic motivations Women were self-driven and ambitious, but it was unusual for them to seek out their first management role. Instead, management opportunities were

frequently facilitated by others or the organisation. Management roles in early career were influenced by organisational structure and policy, while visible and defined promotion pathways and processes assisted others. Where the pathway to manager was unclear, the importance of networks and work-related relationships emerged. As in early career, most women did not perceive their gender as a barrier to accessing management opportunities. Instead most women perceived that opportunity was created through competence and hard work. However, a rising awareness of the gendered landscape was seen, as some women became aware of conservative or antagonistic attitudes and realised that promotion and opportunity was not solely based on merit.

6.6 Encountering Change and Challenge

As the participants assumed their new roles, their experience was characterised by change and challenge. Becoming a manager was a positive time for most women, but encountering altered relational dynamics and new responsibilities and expectations that accompanied the role generated feelings of uncertainty and anxiety.

The influences that shaped this stage of the transition are presented in Figure 6.6:

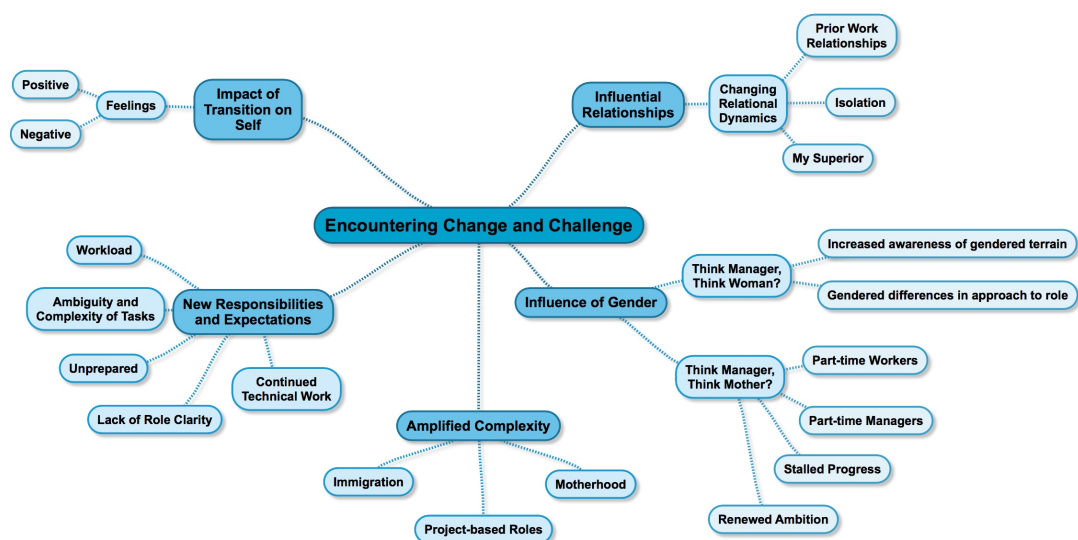


Figure 6.6 - Encountering Change and Challenge: Influencing Factors

6.6.1 Feelings about the Transition

The move to manager was a positive experience for most participants. It aligned with and allowed a fuller expression of their personal preferences, abilities and values and fulfilled motivations that had lead them to the decision point. However, the move to the managerial role also brought with it many changes and challenges. Encountering altered relational and structural dynamics generated feelings of uncertainty and anxiety.

6.6.1.1 “I was thrilled” (M2)

Many women expressed their excitement and pride at reaching their first managerial role. Several participants commented that the move to manager was something that they were ready for and described feelings of relief and accomplishment.

“Oh, I was thrilled. You felt good about yourself. I certainly got more interested in work. Before it was just something... you know I left uni and I had to get a job.” (M2)

6.6.1.2 “It wasn’t easy at all!” (M8)

Feelings of stress and anxiety appeared to result from heavy workloads, long working hours, isolation, encountering new relationship dynamics and issues of control, ambiguity and lack of clarity. Some women felt unprepared for aspects of their new roles.

“I looked at what he did, and I thought, “I could do that! This is easy.” And that then became my goal, was to get to that position. But it wasn’t easy at all! And some of that is my own fault, because I’m a bit of a perfectionist.” (M8)

6.6.2 Changing Relational Dynamics

Moving to a managerial role involves a shift within the organisational hierarchy. For many women this was accompanied by changing relational dynamics with superiors, peer groups and team members. These relationships were vital to the

transition experience and were simultaneously a source of tension and challenge, and of support. There was a need to establish or re-negotiate relationships.

6.6.2.1 *"I knew the people, and they knew me" (M5)*

Managing other people was a defining aspect of the new managerial role, as detailed in Chapter 4. Some women became managers of their previous team, or of people that they knew and had worked with previously. The resultant familiarity was perceived as an advantage and facilitated their transition.

"I knew the people, they knew me and I think there was respect on both sides as to our abilities. So I actually found it quite easy to move into that." (M5)

Moving from within a team to leading a team was accompanied by the challenge of managing impressions and expectations of the team members.

"It's quite difficult as the people that I would have been closest to before, when I was in a technical role, then I'm now manager of and I've got to manage... their impression of what I'm doing..." (P1)

6.6.2.2 *"I feel as though I'm on my own" (M21)*

Some women felt isolated as they changed in position in the organisational hierarchy. There was a need to locate and establish relationships with a new peer group.

"Management can be very much an 'us and them' scenario. You become one of the managers, rather than one of the workers, which can be quite isolating sometimes." (P3)

For some women, being the only woman in a new peer group compounded these feelings of isolation.

"There's not any more females since I got into the management ranks... for being able to share and join with. So I feel as though I'm on my own." (M21)

6.6.2.3 *“He’s not a very good manager” (P1)*

Many women enjoyed positive and supportive relationships from their immediate superior. For others, the relationship with the new boss did not meet expectations providing a challenge to be negotiated as they settled into their new roles:

*“I would say that my interface with my boss is not... he’s not a very good manager... he flat out lies to people. // He’s sh*t and above him is even worse.”*
(P1)

6.6.3 New Responsibilities and Expectations

As the women began to explore, understand and enact their roles they encountered some specific challenges related to the nature of their new roles. These included managing the workload of new multi-faceted and complex roles, detailed in Chapter 4. Some women were challenged by ambiguity stemming from the very nature of managerial work, or resulting from a lack of clarity around role expectations. The transition from an individual worker to manager of others was challenging and many women were confronted with the realisation that business outcomes were now achieved through others rather than individual efforts. Tension from a continued link to technical work or previous roles was common.

6.6.3.1 *“A very heavy load, very heavy.” (M19)*

The most common challenge encountered by the participants was a heavy workload and an increase in working hours required to fulfil their new role. Long hours caused tiredness and exhaustion that impacted some women at work and at home.

“And really, it was what cost me my marriage, was the hours that I worked. There were other issues too, but it was certainly quite a big contributing factor.”
(M8)

Heavy workloads were a result of the multi-faceted and complex roles that the women transitioned to, previously explored in Chapter 4. Inexperienced or under-resourced teams placed additional pressure on new managers. They perceived a need to take on extra work due to a lack of delegation pathways or to compensate for a lack of expertise in their teams.

“I had nobody to delegate to and that’s been an on-going issue because I never had anybody to delegate to who’s been as good as I am.” (M21)

6.6.3.2 “Management issues don’t always have clear solutions” (M19)

Some women described the move from an individual worker to a manager of a team as stressful. Work tasks became increasingly complex and ambiguous as their roles moved away from finite engineering problems and expanded to include running teams and managing other people. As high achievers in their preceding roles, many women felt a lack of control when relying on the outputs of others.

“Being an engineer you like to control things a lot, you like to control the outcome, you design things, you know everything could go wrong and you have got something in place for it to stop going wrong. But with people it is not quite like that.” (M19)

In addition, the increase in complexity of problems and the absence of black and white solutions was challenging for some women:

“I like it if I can solve problems but some of these management issues don’t always have clear solutions and sometimes the issues they keep going.” (M19)

6.6.3.3 “Thrown into the deep end” (M8)

A small number of women revealed that they felt quite unprepared for their new role. This was particularly the case for women that were moved to managerial roles early in their career, or were abruptly appointed.

“the Associate announced he had cancer, and so I really got thrown in the deep end. I got to manage the whole section... and get the show back on the road.”
(M8)

A further challenge related to a lack of clarity of expectations of what their role entailed and associated behaviours. In one case, this uncertainty stemmed from poor communication between the new manager and her superior. The lack of clarity led to uncertainty about role priorities and boundaries, self-doubt and insecurity in the new role.

“In terms of his expectation of what I’m meant to be doing, I’ve got absolutely no idea, other than the more money we make the better.” (P1)

6.6.3.4 *“The best of both worlds”* (M13)

Despite having moved into roles that were labelled as manager, many women continued to perform technical work in addition to new management and leadership responsibilities. This was influenced by both organisational job design and women’s individual preferences.

Some women simply enjoyed technical work and had purposely chosen roles that allowed them to combine their interest in technical work, with managerial tasks and hierarchical status.

“I missed construction, but the realisation was that I was never going to get onto a construction site again unless I moved into a construction company. So I accepted a project manager’s role so it gave me the best of both worlds.” (M13)

In the military, engineering roles were purposefully designed to integrate both technical and managerial aspects. One military manager eloquently described the holistic nature of her responsibilities:

“For us in the technical areas it’s an inherent part of our profession. So it’s not treated as a separate responsibility, it’s treated as an integrated response.” (M9)

In these cases, participants managed to integrate the technical and managerial tasks aspects of their role with ease.

For others, the continued connection to technical work was not an official part of their new role and became a source of tension. Many women were reluctant to move away from technical work. They hesitated in relinquishing control of previous projects or clients, or feared of the loss of technical expertise that had required great investment in early career.

"I've struggled with wanting to hold on to the specialist technical type skills which I've developed up over the last ten years in sort of... because [speciality] is a kind of black art.// It's very, yeah, it's a specialist area that you get a feel for after working at it over time and those skills are really valuable." (M3)

6.6.3.5 "Work on the business rather than in the business" (M16)

Attempting to meet the demands of a new role whilst continuing technical work resulted in heavy workloads. Some acknowledged a need to move on from or "let go of" the technical realm in order to alleviate the tension.

"Some of it's my fault, in not being able to really let go of some of the technical stuff. Possibly I hold onto it a little bit too much. / Maybe I do create some of my own nightmares." (P1)

A challenge for many women was to alter their perspective "to work on the business rather than in the business." (M16)

6.6.4 Think Manager, Think Woman?

As the women moved into and began to enact these roles, an increased awareness of the influence of gender on their experience. Encountering restrictive gendered roles and perceptions caused frustration and had some women questioning the veracity of merit. In parallel, several women began to notice gendered differences in approaches to management and leadership, skills and motivations. These differences were mostly perceived as advantageous to the women managers and as giving them an edge over male peers.

6.6.4.1 *“They were able to progress and become managers and to be seen as managers far more easily” (M2)*

In early career, a common relationship dynamic between a young female engineer and older male colleagues was that of the daughter or granddaughter role. Initially, this was perceived to facilitate career progress as male colleagues acted in protective and supportive ways. This role dynamic became restrictive as the women moved into and began to enact management roles.

“The guys, I think had it tougher at the start but because they were more... they weren’t protected in such a way, they were able to progress and become managers and to be seen as managers far more easily as we got older. Not when we first got given our roles but sort of ten years later.” (M2)

A specialist practitioner expressed frustration towards her organisation’s management, described as “the old guard”, and explained how she and other women in her workplace felt constrained and even obstructed by them:

“I’m definitely not the only female in this organisation who is frustrated at the moment... we drew this champagne bottle where... we feel like there’s a whole coup of women here in this organisation who feel like we’ve got all this fizz and bubble and bursting with good ideas and want to do things and feel like we’ve got what it takes to deliver it but we feel like we are capped by this management, sort of older level engineering staff that just keep a lid on us. They are kind of constantly pushing us down which is making us even... it’s almost like there is so much pressure that it’s about to burst.” (M3)

Disparate views on progression by merit surfaced as the women developed their managerial careers. The realisation by some women that their hard work and competence weren’t always enough because:

“Women don’t advance on their merits all of the time.” (P3)

6.6.4.2 *“I don’t know whether that’s because I’m female or...” (M13)*

Several women questioned as to whether the tension and uncertainty that they experienced in their career was on account of their gender or their age. Interestingly, they did not appear to question whether it was the combination of both gender and age. This was particularly the case for women who assumed managerial responsibility at a young age, or at an age younger than their male peers.

“I’m still relatively young compared to some of the other directors within the Department. You know, they’re all male, they’re all in their mid-50s.

Do you get scrutinised so much because you are female or do your projects get put under the radar a bit more because of your age? ... sometimes I think it’s not because I’m female, I think it’s sometimes because I’m relatively young.”
(M13)

6.6.4.3 *“Oh, you’re the regional manager?” (M18)*

Other participants felt the jarring impact of stereotypes and expectations in interactions external to their workplace. They described experiences of being perceived as a “pushover”, of not being taken seriously and of not being perceived as the person in charge.

“Yes, you would get incidents where... you go into a meeting // The very first time you’d walk in they’d look towards [Male Colleague] in particular because he was about 20 years older than me, [Male Colleague 1] or [Male Colleague 2] to go “Oh you’re the Regional Manager?” (M18)

6.6.4.4 *“A lot of blokes... if they tried to do my job they’d fall over in five minutes”* (M21)

The move to manager was accompanied by a growing awareness and observation of gender that was not verbalised in earlier career stages. This was described by one participant as a process of “becoming conscious” (M4). The participants

made observations about themselves and noted differing approaches and motivations that in others.

"I've started to recognise that there are differences in the way that women do things that may or may not get similar results to the way that men would get."
(M4)

The observations were mostly cast as advantageous for women. The perceived advantages related to the differences in approach, perspective and skill that the women brought to their roles. These advantages included a relational approach to management and leadership, perceived heightened emotional intelligence, intuition and listening skills, and masterful multi-tasking abilities. The participants viewed these differences as giving them an edge over male peers.

"A lot of blokes... if they tried to do my job they'd fall over in five minutes. I have so many things going on at once and I, sort of, survive. I'd probably survive a lot longer than a bloke would with the same number of things going on simultaneously." (M21)

An exception was the perception surrounding emotion in the workplace. A number of the participants spoke of becoming aware of their emotional nature, expressed by one woman as a tendency to react emotionally to happenings at work. There was a perception that this was not advantageous in the engineering workplace and that emotions should be tempered.

Respondent: "It is seen as detrimental when a woman is emotional."

Interviewer: "By whom?"

Respondent: "By others. I think generally it is, men can be it better. They tend to have a range where angry is okay as long as it is not too angry that if they are breaking things that is not okay, but being occasionally angry and having a few outbursts seems to be okay. But if a woman does it, it is not okay, or if a woman starts to cry it is not okay for sure." (M19)

6.6.5 Think Manager, Think Mother?

Motherhood commonly coincided with the transition to manager and leader, with 10 of 16 women with children, having them at the time of being ready to move to the first managerial role, or after having taken that role. This life event did not preclude career success, but presented an additional layer of change and challenge that required adjustment and active management.

6.6.5.1 “[Company] have been pretty clear that they will not offer a management role on under four days a week” (M5)

All women that had children took a period of maternity leave from work. This ranged from six weeks to 12 months. Shorter maternity leave was usually associated with a need to return to work, driven by the individual or by the needs of the organisation.

It was most common for women to return to work, following the arrival of children, in a part-time capacity. Part-time work was available in all organisations and supported by organisational policy. This is further explored in section 6.7. The ability to continue in a managerial role in a part-time capacity was influenced by the organisation – the organisational policies and implementation of those policies by other managers – and the prevailing economic climate.

Most participants were able to continue in their previous roles or work in roles of similar organisational status in a part-time capacity. Women in the military, or those employed in organisations with a partnership or employee ownership structure retained their rank or organisational level. In addition, women working as project managers were frequently able to return to their positions in a part-time capacity.

*“I then returned to work when [Child 2] was about a year old, on a part-time basis, into this job now as the [Role Type] Manager for our new [asset type 1].”
(M11)*

Other women were constrained by organisational policy. They were required to revert to technical roles deemed suitable for part-time work or struggled with the obtaining the formal recognition of a management or leadership position or job title while working part-time, despite performing the tasks.

“I had a child, my little boy [child’s name] in 2005, that was absolutely a highlight (laughs) and took a year’s maternity leave, came back part-time and I guess [current company] have been pretty clear that they will not offer a management role on under four days a week. I only wanted to work three days a week so at that point I went back into a technical role.” (M5)

6.6.5.2 *“She’s going to work part-time. We’re going to have to carry her workload”. (M13)*

Most women arranged reduced working hours to accommodate new parenting responsibilities. However, the career narratives of the women in this study indicate that a stigma towards part-time work or flexible work arrangements exists in the engineering profession.

The attitude directed towards part-time workers was summarised by one project director. Whilst on maternity leave, she was approached to apply for a particular project director position. She agreed, but was clear on the terms that would enable her to do so - part-time work, the ability to work from home and the flexibility to manage her own time. She was the recipient of comments regarding the effect of her part-time work status on her team:

“It was interesting to hear some of the comments... by some of the people that thought they would be reporting to me “Oh, she’s going to work part-time. That means that we’re going to have to carry her workload...” (M13)

6.6.5.3 *“ ‘I’m your new CO’. I’m holding a baby, and her jaw just dropped”. (M10)*

The data provides further evidence of the expected and accepted roles of women in the engineering workforce, particularly with regards to women as mothers and managers. Some women experienced resistance when they did not match the

prevailing image. A senior military woman related her experience of entering a senior role with a young baby:

"I'm standing in the orderly room to see the old CO, just to introduce myself, standing there with a baby just in civvies, and I go to the orderly room clerk, she's 'May I help you', I said 'yes [Rank, Participant's Name], I just want to see the CO'. 'Sorry who are you?' I said [Rank, Participant's Name] I'm your new CO'. I'm holding a baby, and her jaw just dropped. It was really funny". (M10)

6.6.5.4 *"I think I've gone fast and then gone nowhere." (M2)*

Returning to work after having children was characterised by a new relational dynamic and structural barriers that affected the women's internal experience. Several women felt that their careers stalled or failed to progress at the same rate after having children.

"I actually feel that as I'm not working that much I've kind of stalemated... I think I've gone fast and then gone nowhere." (M2)

This was a frustrating experience. Many perceived a need to make choices and compromises at this time in their careers. This included choosing particular roles that would enable them to more easily meet demands, delaying further study and accepting that career progress may be slower.

6.6.5.5 *"If I'm going to have commitment to my work, then I want to progress." (M12)*

Part-time work arrangements were commonly temporary, with women increasing their hours to full-time hours in between children, or after completion of their families. Accommodating career aspirations, full-time work and the responsibility of family was a key challenge.

"The young ones, they don't know. They have no idea what it's like to have children and to try to be there 100 per cent for your work, 100 percent for your husband... because there's nothing left for you." (M21)

The effort and sacrifice made by the women to maintain careers served to increase ambition and career focus after establishing their families.

“When I came back from having my second child and went back full-time I really decided ‘Well. If I’m not going to be part-time and have this shared responsibility, if I’m going to have commitment to my work, then I want to progress and have that meaningful - as meaningful as being home looking after my children’. // I suppose that reignited my ambition to want to progress and to aspire to become as successful as I could be.” (M12)

6.6.6 Amplified Complexity

The complexity of the transition to manager was amplified for some women by a number of structural influences. These factors predicated an interruption to the transition with a return to technical engineering roles, rather than a continuation of management responsibilities. In addition to rigid company policy regarding part-time managers previously described, oscillation between engineering and management was due to the project-based nature of engineering work and the need to re-establish a career following emigration to Australia from overseas.

6.6.6.1 *“I then went back into [engineering roles in] big projects” (P3)*

Several women were involved in project work, in which project teams were resourced for the duration of the project and then were disbanded. Women employed in this mode were typically drawn from an ‘engineering pool’ within their organisation. They fulfilled managerial or leadership roles with a finite duration that were linked to that project. Upon completion of the project or project phase, the women returned to the engineering pool or were assigned to a subsequent role on a different project.

Some women reverted to technical roles after having worked in a project-based management role. This did not preclude the continuation of the transition journey, but it did serve to amplify the complexity and fluidity of the journey for some women. One participant working in the resources sector explained that she returned to engineering roles on major projects, after working as a Lead Engineer

on small projects. This return to technical work appeared as an interruption to her transition but served to prepare her for subsequent leadership roles.

"I then went back into [engineering roles in] big projects and I worked in [commodity] for the next few years. And I was probably ready to step into a lead role on a major project when I had Daughter 1." (P3)

6.6.6.2 "I had to start from scratch" (M20)

A number of the participants had immigrated to Australia at some point during their careers. This relocation coincided with a step-down in position for two women. Despite having previously worked as manager and leaders in their countries of origin, one woman found herself returning to technical role upon entry to Australia; the other was required to completely requalify and recommence a career in junior technical roles.

"I got a job as a shop assistant in a second-hand good shop. They put me in a section where I had to fix the radios and electrical things, which I've not touched before because my first job is related to civil engineering... //

I had to start from scratch and they didn't recognise my education because it's not – from British, something like that. So I managed to finish the course, but in between that I was working fulltime." (M20)

6.6.7 Encountering Change and Challenge - Summary

The move into a managerial role was commonly a positive experience, but the changes and challenges accompanying the new role did breed uncertainty and anxiety for many women. Women were required to negotiate altered relationship dynamics as they repositioned themselves and redefined relationships within the organisational fabric. Many women experienced isolation after assuming a managerial role. New managerial roles were characterised by ambiguity and complexity. Many women struggled under a heavy workload as they attempted to juggle new responsibilities while exiting from their previous roles. The move away from individual worker status presented a particular challenge. The tension

between a desire for continued technical work and the need to relinquish control of work to others was evident.

Following appointment to managerial roles, the participants expressed an increased awareness of gendered differences in the workplace and many encountered restrictive attitudes for the first time. Women that became mothers during this time confronted individual attitudes and constraining organisational policy concerning women in authority with children and stigma regarding part-time workers. Many women expressed frustration at the difficulty of making career progress during this time.

In addition to motherhood, the transition journey was made more complex for some women who encountered structural barriers in the form of project-based engineering work and international relocation. For these women, the transition to manager was interrupted as they reverted to technical engineering roles.

6.7 Negotiating the Environment

As they establish themselves in their new roles, the women react and adjust to many changes and challenges. The data revealed that participants primarily called on individual and relational resources to do this. Many women worked to their strengths and skills, while in tandem, placed great emphasis on building and using relationships to assist their transition. Aspects of the broader organisation also facilitated the transition for some women, but were less prevalent in their accounts.

The themes informing this stage of the transition are presented in Figure 6.7.

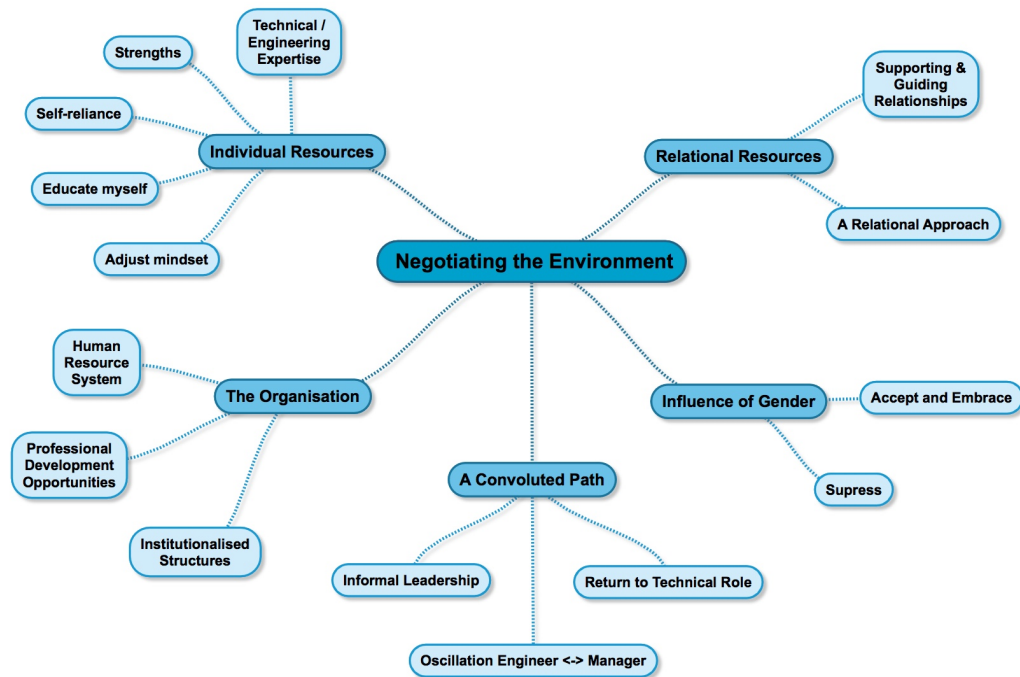


Figure 6.7 - Negotiating the Environment: Influencing Factors

6.7.1 Individual Resources

To negotiate the changes and challenges associated with their role transition, the participants drew on identified personal strengths, skills, and approaches that had been useful in previous roles. Many women can be described as highly self-reliant with a tendency to look inwards for solutions.

Participants described a need to adapt their thinking and behaviours in response to the increased ambiguity and complexity of their roles. The adjustment of the technical mindset to one with a longer-term focus was emphasised. However, in a surprising contrast, retention of technical expertise was also noted as supporting the transition to manager.

6.7.1.1 *"I think it's been a case of working to my strengths" (P2)*

The participants drew on identified personal qualities and learned skills to negotiate the challenges and changes associated with their transition. The

attributes that directed them towards managerial careers, such as a penchant for organising and ability to deal with complex information and situations, served as useful resources in later phases.

"I think it's been a case of working to my strengths and also recognising when I needed to change a situation." (P2)

A problem-solving orientation was a recurrent attribute. Several women drew on this quality in their new role, to address challenges such as ambiguity and lack of clarity.

"Once you have learnt to do solving a problem with good engineering training and if you have an interest in digging deep to really know what the problem is... then you come up with a pretty good answer usually. I tend to apply the same skills to managing all sorts of problems." (M19)

6.7.1.2 *"It wasn't in my thought process that I should go and ask somebody" (P2)*

The data revealed many women to be highly self-reliant with a tendency to "get on with it" and to not seek assistance from others. One woman, reflecting on the role of mentoring in her later career, described how she had never thought to seek guidance from others at the time of her role transition.

"it wasn't in my thought process that... I should go and ask somebody for help or assistance." (P2)

As they acted out their new roles, many women were seen to replicate techniques from early career. The tendency to work very hard, used in early career to gather experience, signal competence and establish credibility, was later used to manage heavy workloads and multiple demands. Women managers described themselves as workaholics and jugglers.

"I'm a workaholic (laughs). Like today, who could be a woman starting [work] at 7 o'clock and still go to uni at night?" (M20)

The need to push harder and prove oneself was keenly felt by women with children. There was a sense of needing to compensate for part-time work status and to act as ambassadors for other women and parents more broadly.

6.7.1.3 “Educate yourself” (M4)

A small number of participants made explicit reference to self-education. One participant spoke of a particular book that she had found useful in her transition. Through her advice to other engineers, another participant highlighted the need to be curious and questioning and to proactively access knowledge through observation and inquiry.

“The other thing I would advise is to educate yourself, so look around at how decisions are made and they’re not made in the same way in all commercial businesses.” (M4)

Wider life experiences such as parenting and volunteer work developed skills and clarified values that were subsequently found to be advantageous in the workplace. Reflecting on the impact of becoming a parent on becoming a manager:

“You learnt to achieve results without worrying if you are right or wrong. // You learn your negotiation skills and motivation that perhaps your self-pride might have got in the way before. Whereas you dig your heels in when you just want a result, you have a different approach. So you become more focused on the outcomes rather than the process.” (P3)

6.7.1.4 “You will need to adjust your technical mindset” (M4)

Women learned to manage the increased breadth and complexity of their jobs. Several women described a “mind shift” or “paradigm shift” required to move from a day to day thinking to a longer-term focus, and to cope with the uncertainty characteristic of their higher organisation roles.

“If you are coming out of a technical role, recognise that you will be faced with budget and commercial decisions and that you will need to adjust your technical mindset slightly to accommodate those as they are not always certain.” (M4)

Changes to decision making behaviour also featured in the data. One participant described how she became more critical of information, and her need to be more deeply analytical. Another described how she needed to adapt to ambiguity and absence of information when making decisions.

6.7.1.5 *“I think it’s very few that can lose the technical information” (M16)*

As noted earlier many women continued to have technical responsibilities following their appointment to a managerial role. This sustained link to technical work created tension but was also a strategy for negotiating the transition.

“I think it’s very few that can lose the technical information. Just the very elite group at the top, but I think everyone else needs to hold onto it.” (M16)

Technical expertise was a measure of competence, and a means for building credibility and gaining respect of peers and subordinates in early career, on entry to and while acting out of the first managerial role. This interplay between the individual resource of technical expertise and relational aspects is further explored in section 6.7.3.

Technical ability was also described as a protective measure - as a shield to ward off tough team members or as a safety net during phases of uncertainty when taking on management roles:

“I’d done work experience where I’d literally just driven trucks and shovelled dirt and that sort of thing. And whilst that didn’t teach me a huge amount about the individual sections of the work that I managed, it gave you the ability to talk to the people that were doing that sort of work. And just a bit of street credibility. And I think that’s really important because they can be tough on you otherwise.” (M2)

Others felt that continued technical work, or upkeep of technical knowledge was a necessary career strategy. Technical knowledge had the potential to act as a fall-back.

“I’ve always kept strong links with the local government and with the engineering fraternities to make sure that if I do want to go back into that area that they still recognise that I can and to maintain my knowledge in those sort of areas.” (M12)

This was pertinent for several women who had followed a convoluted management pathway, returning to technical work at times during their careers. For these women, the maintenance of technical expertise was a strategy for sustaining their career. This aspect of the management transition is further explored in Section 6.7.5.

6.7.2 Supportive and Guiding Relationships

Relationships with others both inside and outside of the workplace were key to managing the transition. The participants obtained support, guidance, inspiration and validation from mentors, role models, direct supervisors and networks. These relationships built self-confidence and provided a sense of belonging. Spouses and extended family provided practical assistance that enabled the transition.

6.7.2.1 “I have had mentors, they’ve tended not to be formal” (M5)

The consistent view was that a mentor relationship is very important to the transition to manager / leader. This relationship was perceived as valuable for guiding the transition, for assisting with impression management and managing upwards.

Those that had a mentoring relationship as they commenced their managerial roles favoured informal mentoring relationships. A small number of women sought a formal mentoring relationship or engaged an external coach.

Engagement with informal mentors tended to be unstructured and irregular. Key to establishing this relationship was a mutual rapport, respect and trust.

“I think people should have mentors and they should use mentors // I have had mentors, they’ve tended not to be formal.” (M5)

Several women commented that formal mentoring programs were available to them, but stated that they did not participate. Some women were too busy to commit to a formal program; others felt that mentoring relationships could not be forced preferring to let them evolve naturally. As in earlier phases of the transition, those that did not have access to a mentor wished that they did.

Another key relationship was that of sponsor or advocate. Described by one woman as “influential people” in her career, sponsors and advocates were not direct supervisors but typically further removed. In a similar way to mentoring, sponsor or advocate relationships were often formed with a contact from previous work.

Sponsors and advocates fostered or guided careers. They provided opportunities or pathways that may not have existed in the absence of the relationship. This was particularly important for part-time workers who may be perceived as not being interested in or available for opportunities, or simply forgotten.

“There is an issue there that when you go part-time, if there is not somebody there understanding that a career path can still happen and being an advocate for you, you will be forgotten.” (M5)

6.7.2.2 “I also now have a female mentor” (M13)

Some women mentioned the valuable presence of female mentors or role models at work. Female mentors, often in the form of other female managers, could provide an alternative perspective or guidance based on their own experiences.

“I’ve always had guys as my mentors, guys that I can go and bitch to and complain to and seek the direction of. // I also now have a female mentor and

what I've discovered is that... the style between men and women and very, very different." (M13)

Female mentors and role models within the workplace were not common. Those with access appreciated being able to gain insight in how to effectively negotiate the gendered terrain of the engineering workplace by observing others do it. Particular issues related to dealing with the emotions of others at work, and with the juggle of work demands and child rearing.

This was not a unanimous view, with one woman emphasising the value of a male mentor over a female mentor. The reason for this was not explicit, but related statements suggest that a female mentor would not be privy to 'secret men's business' that was perceived to govern her workplace.

Another explained how she perceived some women in senior roles to have made sacrifices in aspects of life to reach the upper echelons. This was an undesirable example for this woman, who placed importance on her domestic life.

"I would have preferred to have a female senior manager, but that sometimes – they've delegated everything and they've lost their home life. I don't want somebody else having my life for me and then my life just to be work. It's very important for me to not fall into that trap." (M21)

6.7.2.3 *"My bosses have given me the opportunity" (M9)*

Receiving support, feedback, empathy and understanding from the direct superior was important to a successful transition. Many women did receive this and most appreciated a balance between guidance and direction, and autonomy to experience and enact their new role.

"My bosses have given me the opportunity to demonstrate, as opposed to holding me back and being a bit scared or nervous." (M9)

Support from supervisors was particularly pertinent for women returning to work following a career break. One participant anticipated difficulty and rigidity on her return to work, but instead she encountered understanding and flexibility.

"I thought if I came back part-time I wouldn't be able to do my role, but I found the company's been very supportive and you know when I said I'd come back part-time the National Manager actually said 'Two days?' and I thought 'Oh, well I was thinking three.'"(M16)

Those that did not feel supported by their immediate superiors reflected that receiving support would have alleviated feelings of uncertainty as they negotiated their new roles.

"I hardly ever see him and apparently, that's my fault for not being in the office enough. // In terms of his expectation of what I'm meant to be doing, I've got absolutely no idea, other than the more money we make the better..." (P1)

6.7.2.4 "I have a sort of circle of very trusted colleagues" (M11)

Internal workplace networks formed from peers and colleagues from previous roles provided a comfortable space to talk or to ask for assistance or advice as the women found their feet in their new roles or faced fresh challenges. Internal networks were complemented with personal and professional contacts external to their organisation. In a similar way to internal networks, personal networks built from university colleagues and work-related contacts were supportive forming a trusted circle availing common understanding and shared experience.

"I have a sort of circle of very trusted colleagues, and a number of men both immediately above and below me, in terms of the hierarchy, that I really feel I could say just about anything to, and they would listen." (M11)

It was more common for the participants to remark on their external, personal networks than their membership of formal, professional networks. This may indicate that the women preferred to utilise networks of their own making, placed greater importance on or derived greater value from them. Linked to this was a sense of the lack of 'fit' within organised networks and encountering difficulty when networking within engineering.

"I don't think women network particularly well in engineering, I find that a struggle. It's quite intimidating because all the blokes network in a certain way... and we don't." (M21)

6.7.2.5 *"A female network is very, very important" (M5)*

Women engineers often formed support networks with other women - other engineers inside and outside of the organisation, and more broadly with other professional women. These networks provided support and provided a sense of belonging. They were a place for sharing of and learning from experiences and frustrations.

Membership to an organised women's network such as Women in Engineering, or Women in Consulting was also common. Some women saw this membership as a mechanism for providing role models to junior women or effecting change in their organisations or professions. Possibly reflecting the recruitment process for data collection in this study, several participants had been instrumental in the development of such networks within their organisation, or externally in cities and regions.

"A female network is very, very important and that's one of the reasons why I've been part of the [Company 1] Professional Network and also part of [Company 2] network to have, be seen with role models to show that women can actually get to higher levels. It's networking, there's just a feeling of sisterhood to talk about common issues and understand that you are not alone." (M5)

Drawing support from other women was important for women as they negotiate the unfamiliar terrain of motherhood and work. Several women in this study were the first woman engineer to take maternity leave in their organisations. This was not unexpected for older participants who were also the only woman engineer in their organisation at the time. However, this trend persisted for those that had become mothers in more recent years.

Not all women were encouraging of organised women's networks. For one woman, an unfavourable experience in early career informed her view on women's networks:

"It felt to us that it became a real man-hating session, which went against my whole principle of 'we have to work together'. And so all these Women in Engineering... and all this stuff sometimes I think doesn't help the cause because it helps to segregate us." (M13)

6.7.2.6 "Without a doubt it's [Husband] supporting what I am doing" (P2)

Support and encouragement from partners and extended family positively influenced the women's advancement. An "even" or "equal" partnership or a "supportive partner" was emphasised as important to career progression.

"Without a doubt it's [Husband] supporting what I am doing... we came to [Capital City] and it was a case of which ever one of us got a job. It wasn't a case of '[Husband] you are getting a job and we are going there' and then I could find a job. It was always sort of even bases." (P2)

Shared caring responsibilities with spouses or extended family was key to maintaining and advancing their careers. Support ranged from shared day care drop-offs and pick-ups, spouses that had the capacity and inclination to work flexibly and care for their children for part of the week, extended family with the availability to look after children, and extended to partners who assumed the primary care role.

"In the family formation period, my husband and I were both working three days a week and we were doing childcare each for two days a week. // We tried to equally disadvantage our careers or advantage our time with children." (M19)

This practical support enabled the women to take on challenging roles or high profile projects, or to relocate overseas or interstate for a key position.

"If the right job came along I might do what we did when we went to [overseas location] where I went full-time and my husband would either do part-time or be at home." (M5)

6.7.3 A Relational Approach

In addition to deriving guidance and support from specific relationship types, many women placed a high value on forming and maintaining relationships within their organisations. The data revealed a move towards working collectively and the leveraging of relationships to facilitate their transition into their new roles.

"I think women tend to define themselves by the quality of the relationships that they can form, and the impact that those relationships have on organisational wellbeing and organisational outcomes. And if they achieve those outcomes through those relationships, that's what gives them the sense of satisfaction." (M11)

6.7.3.1 "You can't work in isolation as a senior manager" (M11)

The move to a managerial role challenged pre-existing beliefs about the nature of management and leadership, resulting in changes to their perceptions. Another common learning concerned the importance of the individual - an awareness that different team members respond to different management and leadership styles, and have varied motivations and capacities. The importance of adapting to the individual was recognised.

"It was a learning curve because not everybody wants to be led the way that you want to be lead, because every personality's different." (M12)

Several women spoke of their move to working collectively, rather than individually. One realisation was that as a manager, success was no longer achieved through the self but through others. This was expressed as a need to rely on her team and to relinquish control of the work, or as a shift from individual knowledge towards drawing on the knowledge of others:

“It wasn’t all about the manager needs to know everything. That for me was a massive turning point. // I thought “I don’t actually have to be across and in the depth of everything that I am doing and that’s why I have people not only in my team but more broadly around me that can help me with those things. And when I realised that, life just became so easy - no really - in more ways than one.” (M4)

Working collectively also extended to others within the organisation and external stakeholders. There was a realisation of interconnectedness with other parts of the organisation.

“The interconnectedness of your problems with other people’s problems is much more apparent, you know. // You begin to get a feel for connectivity and of having to deal with that much more complex space. You know, you can’t work in isolation as a senior manager.” (M11)

6.7.3.2 “They knew that I knew my stuff, and so they would respect me for that”. (M8)

As a new manager, the importance of relationships with team members was emphasised. Many women had existing relationships within their new teams – some became the manager of a team that they had been a member of; others had worked with team members in some capacity in previous roles. Underpinning these relationships were credibility and reputation, established through successfully enacting previous engineering roles. This provided a supportive framework for the women as they encountered and adjusted to their new role.

“They knew that I knew my stuff, and so they would respect me for that.” (M8)

A specific form of credibility - labelled as “street-cred” by the participants - featured in the transition for women who came to lead teams of non-professional workers particularly in site locations. Practical experience in early career was important to establishing “street-cred”.

“I think that you need to have been able to have some experience... in some area on the ground... to give you a bit of street-cred when you are talking to the people who you are looking after.” (M2)

For women who self-identified as managers or leaders but were without a formal managerial role within the organisational structure, building a reputation and being at the forefront of their field bestowed an informal leadership.

"I'm quite often getting requests for inputs on different proposals or projects or things, particularly on the [discipline] side with regards to carbon, the whole greenhouse gas side of things. So people see me as a leader in that type of technical point of view." (M3)

6.7.3.3 "He said he had a lot of faith in me" (M18)

A further relational aspect of the women's transition experience was the emphasis on validation and acceptance by others following appointment to their new roles. Validation took the form of positive feedback, constructive and efficient work relationships, and of feeling respected by peers, team members and those in more senior positions. This signalled other's acceptance of them in their new role, increased self-confidence and enabled the women to continue in their roles.

For some women, positive feedback on their performance from others was inspiring and encouraged them to advance further. Others lamented the lack of feedback or acknowledgement of their achievements.

"He said he had a lot of faith in me, 'I think this is where you could be'. I don't know that I agree with him but anyway his view is 'This is where you could be'." (M18)

For others, acceptance by team members facilitated their transition. One woman described validation by team members through their confidence in her ability to learn. As a young manager of more experienced people, this acceptance enabled her to draw on their expertise as she began her new role:

"In terms of day to day business, I think I learnt more from the people who'd done day to day business for a very long time. They demonstrated confidence in my ability to learn, so they would teach me, and I would learn from that, and make a decision." (M9)

6.7.3.4 *“I had a very experienced foreman who also worked for me and helped me along the way” (M2)*

Learning on the job following a managerial appointment was a highly relational activity. Many women drew on the experience of team members and superiors. They learnt from more experienced team members who often occupied non-professional roles such as foremen, operators and skilled tradespeople. Team members with years of experience were key to their transition.

“of course I had a very experienced foreman who also worked for me and helped me along the way. So you were almost being trained by someone that you were responsible for.” (M2)

Several women commented on the importance of adopting a humble and somewhat deferent attitude to access this knowledge. For some women, gaining credibility as managers required additional work and the need to submit to an inverse power relationship. For one woman in the military, help was available to her, but it was conditional on a gendered power dynamic:

“So long as you ask and recognise that you are fallible, people will fall over themselves to give you the assistance you need. It’s a really helpful environment.” (M9)

Women also learnt from their superiors, including role models, immediate managers and others in visible leadership roles. Observing the behaviours and actions of other managers provided a template for their own behaviours as they executed their new roles. Some women observed specific skills employed by incumbent managers and made decisions to develop these skills in themselves. A participant working in a corporate role reflected:

“I actually needed some formal education in strategy and strategic thinking and that’s the thing I noticed people around me doing - my boss and her peers with whom I had to work.” (M4)

6.7.4 Organisational Resources

The participants drew primarily on individual and relational resources to navigate the changes and challenges resulting from their new role. However, resources were also available within the women's organisations and from external parties.

Professional development, through participation in training courses and acquisition of further qualifications, was used. This enabled the participants to build knowledge related to their new roles, to increase self-awareness and enhance confidence. Organisations also used training and development to signal competence or communicate a level of authority to organisational members.

Visible and structured hierarchies imbued with meaning served a similar purpose, signalling the transition to others within the organisation. Company policies, particularly those concerning gender diversity and women's continued workforce participation were perceived to facilitate the women's transitions. However, using organisational policy sometimes created additional challenges for women as they negotiated their senior roles.

6.7.4.1 *"We are running a management program, do you want to participate?"* (M17)

Training courses in project management, leadership development, people management and specialist technical areas, were commonly undertaken by the participants, with delivery both internal and external to their organisations. The opportunity to participate in these courses was often initiated by the organisation or suggested by an immediate superior.

"Pretty much in the first week when I got there they said we are running a management program... do you want to participate?" (M17)

Training courses prompted increased self-awareness and confidence. Participants gained into personality, management and leadership styles, and the philosophical basis of management and leadership.

“They ran a cognitive behaviour workshop here... the main take away for me was just raising my level of self-awareness of why you react in certain ways and why you do things, and being able to rationalise your behaviour.” (M10)

More than half of the participants held or were progressing towards a postgraduate qualification at the time of interview. As with shorter training courses, value was derived from the course content and the broadened thinking and self-reflection resulting from the commitment to and completion of postgraduate study. Reasons for not pursuing formal postgraduate education included a lack of available time, the lack of perceived relevance to their work and a feeling of sufficient preparation from undergraduate qualifications.

6.7.4.2 “I attribute that to the institutionalised structures that the military has” (M11)

A small number of women explicitly spoke about how the structured nature of their organisation assisted them during their transition. Women in military and large organisations described visible hierarchies, position titles and formal career development programs as beneficial.

“I think it’s been remarkably smooth, compared to some women. It hasn’t been a struggle. But I attribute that probably to the institutionalised structures that the military has, and to the training that goes with it. You know, if you prepare people for transition, they generally do it well, and they do it quite graciously.” (M11)

Highly structured organisations appeared to work in the women’s favour in two ways. First was the access to formal career development programs often attached to the organisational hierarchy. For example, in some organisations career development was integrated into the promotion process and participation was required for promotion to a certain organisational level.

Secondly, structures such as hierarchical position and role title possess meaning within the organisation and signal authority and power to other members of the organisation. In the military organisation, the transition to leader was marked by attendance of a one year long training course, in which participants were

removed from the organisation for education purposes. This signified the transition from the organisational point of view.

External signalling was also achieved through the acquisition of additional qualifications and credentials, such as engineering chartership. This was not common with only three participants achieving their chartered engineering registration on the transition journey.

6.7.4.3 *“The HR systems are all set up” (M5)*

Some women felt that company systems had assisted their transition. Typically, the women referred to organisational gender diversity policies and initiatives with the purpose of retaining the expertise of female employees and increasing the number of women in senior roles.

“A couple of years back, they thought ‘Hmm, it’s about time we had a woman director. So where’s our pool of people?’ So they have started... the Diversity Working Group... and under that sits the Women’s Initiative.” (P2)

Organisational policies concerning the provision of child-care, availability of part-time work, job sharing and flexible working enabled women with children to continue employment while managing familial responsibilities. As noted in section 6.6.5, part-time work was available in all organisations and was commonly used by the participants.

“As a primary care-giver, it’s not unexpected for me to ask for part-time work. So it’s easy, the HR systems are all kind of set up.” (M5)

However, extant company policy was not without problems. In some organisations, the implementation and availability of these policies was dependent on an individual’s direct manager.

“It depends on the personality of your boss at the time. Theoretically we’ve always had the ability to work part-time for a number of years now, but not all bosses will support it, it just depends.” (M10)

In other organisations, part-time managerial roles were not available resulting in women interrupting their managerial path and returning to technical engineering roles for periods of time.

6.7.5 A Convoluted Path

Several women encountered structural constraints that complicated their transition journey. This resulted in a return to technical roles rather than continued managerial work. For some women, this was experienced as an oscillation back and forth between management and technical roles; others returned to pursuing a technical career.

Returning to technical roles – whether temporarily or for an extended period – was a strategy employed in response to structural constraints and drew upon individual, relational and organisational resources. Oscillation between technical and management roles may be considered as an interrupted path, however, it enabled the participants a continued, albeit convoluted and reconceptualised, transition.

6.7.5.1 *Oscillation: from engineer to manager and back again*

After the first managerial role, 9 of 22 women moved back and forth between managerial and technical roles. This was observed in some women who became mothers after their initial move to a managerial role (Section 6.6.5.1). In addition to motherhood, oscillation was also experienced by women who had held project-linked leadership roles and by a small number of women that moved to Australia from overseas (Section 6.6.6). These women found themselves moving back into technical roles upon having their child and returning from maternity leave, upon completion of the project or following relocation.

Key to this oscillating career pattern was the maintenance of the women's technical expertise. As discussed previously, technical expertise was a measure of competence and a protective measure, enabling women to navigate challenging relationship dynamics within the workforce. For this group of women who encounter additional structural barriers, retaining a technical link

also became a strategy to enable them to continue their transition in an alternative guise.

6.7.5.2 *“I’d much rather stay on the much more technical side of it” (M22)*

Some women returned to technical roles and remained there. At the time of interview, they had not returned to managerial roles. Instead they were pursuing technical career paths and identifying as leaders in the technical realm.

Enjoyment derived from technical work continued to drive career decisions with some women returned to engineering roles to fulfil personal preference, rather than being influenced by structural factors. These women expressed a passion for technical work and chose to pursue technical specialist roles instead.

Renouncing the responsibilities and workload associated with managerial roles was a choice made by some women. For one woman, the politics associated with management roles was unappealing and the perceived simplicity of technical roles was attractive. For others, it alleviated work-related stress and enhanced satisfaction.

“Basically I had a melt down and decided that I can't lead the team anymore, I'd much rather stay on the much more technical side of it.” (M22)

This suggests that reconceptualisation of the concept of transition to a journey that is multi-directional and involves several steps is needed.

6.7.6 Negotiating Gender

As they moved into senior roles, the participants encountered restrictive gendered roles and attitudes, questioned previously held perceptions and became aware of differences between men and women in the workplace. The gendered workplace terrain was negotiated using a blend of practices that both suppressed and embraced aspects of the women's gender.

6.7.6.1 *“When you start talking, people know that you talk business” (M17)*

Several women continued to place emphasis on competence and merit as their approach to navigating the gendered work environment. There was a desire to be regarded for their ability – now as managers in engineering, rather than as women engineers.

“It has nothing to do with you being a female, it has just got to do that when you start talking people know that you talk business. You are not a little girly thing that stands there.” (M17)

This echoes themes discussed above of technical competence, credibility and reputation, and of proving oneself through hard work as was seen in earlier transition phases. For these women, competence, credibility and reputation was seen as compensating for, or making their gender invisible, and facilitated their acceptance in the profession and in senior roles.

6.7.6.2 *Don’t “get yourself tripped up with ‘fighting for the female’” (M21)*

While many women were involved in and drew support from women’s networks (Section 6.7.2.5), a parallel discourse was the reluctance to be perceived as having an agenda of differentiating women engineers. This extended to an aversion to human resource policies aimed at increasing the number of women in senior roles and measures that were seen as positive discrimination or perceived tokenism.

“Philosophically, I’ve always been of the view that if we choose as women to do an engineering discipline then we don’t need to be segregated and we shouldn’t be looking for advantages because we are a different gender, because essentially we technically compete on the same level.” (M12)

One participant avoided women’s only initiatives of any sort, lest she be branded a feminist or as a female manager rather than a manager. This illustrates the bind that many women find themselves in where their gender and their competence are considered separately and rarely ever seen as mutually reinforcing.

“You’ve got to also not get yourself tripped up with the ‘fighting for the female’ side of things because it’s extremely off-putting I think. I don’t think it helps you. So I was a bit reluctant to take up this women’s leadership thing because I didn’t want to be perceived as a feminist. I want to be perceived as a manager. Not a female.” (M21)

6.7.6.3 “You will probably get more support out of people if you just rub along with the vast majority (M11)”

The data revealed a sense of acceptance of engineering as a male dominated environment, or a “boy’s club”. Participants advised other women engineers to know “what you were up against” (M12) as a woman in such an environment and to gain respect of male colleagues and fit in.

For some, this entailed seeking to be seen as ‘one of the boys’ by adopting masculine behaviours or speech.

“I was the first girl here to go on a golf tour with them and you could see the concern in some of their eyes. It was like ‘oh my we are taking a girl’. So the first thing I did was pick up my beer at 8am in the morning... and I thought I don’t really want this.” (M17)

For others, it involved appearing strong and confident, and suppressing or denying certain behaviours that may be perceived as weak or flimsy – that is, behaviours that would draw unwanted attention to their gender. This included ignoring harassing or negative behaviours and tempering of emotion at work.

“Oh people still knock my confidence but I’ll always try and give an impression that they haven’t. // I think it’s vital in that if you start caving, showing that you’re weak, that’s the end of it. You know, people will jump on you.” (M21)

For others, it was a case of just getting on with people and not rocking the boat.

“you will probably get more support out of people if you just rub along with the vast majority. And if the vast majority are men, then learn how to run along with them, you know.” (M11)

6.7.6.4 *“I won’t say that I milked it, but I was grateful for it” (M2)*

An interesting contradiction was seen in the data. Alongside the suppression of certain female qualities was the desire to retain a sense of being female and a “feminine side”. However, this was not at the expense of being considered competent as a manager.

“I still don’t want to lose myself as a female. I think it’s vital to keep your feminine side and add to the business the extra that you do from being a female... but not to be perceived as a female, other than you’re a manager and you bring your own skills to that.” (M21)

In addition, several participants saw their gender as a point of difference that could be used to their benefit. They responded to gendered relationships with male colleagues, such as paternalistic father/grandfather/daughter roles, by purposefully shaping these relationships to their advantage.

“I won’t say that I milked it, but I was grateful for it and therefore I built relationships with those men in that way. Sort of purged them for information that they had, that sort of thing.” (M2)

Using gender to one’s advantage or “playing on” gender was done quietly – almost in a veiled or surreptitious way - but it was viewed as a natural and effective strategy. One participant explained:

“If I were a guy I would do it in a different way. Does that mean that I’ve abused it? No, I’ve just used who I am.” (M9)

6.7.6.5 *“It’s our new mother” (P1)*

In addition to the father/daughter dynamic, maternal symbolism was prevalent in the women’s narratives relating to their enacting their managerial roles. Several women described themselves as the mother of the group, or as taking a “mother-role” when they became managers. A new archetype for these women of the ‘organisational mother’ emerges.

"I felt that the team actually handled it really well... going from X being their boss to me being their boss... although maybe it's all "of, it's our new mother" [laughs]... so that was actually the easiest part of it." (P1)

The 'organisational mother' archetype is linked with caring language used to describe the manager – team member relationship. This is in contrast to the more directive language used to describe other managers within engineering previously explored in section 4.3.2. Instead, women make sense of their negotiation of gendered terrain using established gendered stereotypes or archetypes that embody largely accepted and acceptable roles for women. This stands in contrast to their desire for their gender not to be seen and points to the challenges women face in terms of their own and others expectations about women in leadership roles.

6.7.7 Negotiating the Environment – Summary

The move to the first managerial role was characterised by change and challenge. The study participants drew on a blend of individual, relational and structural resources to negotiate the demands of their new role.

The women appeared self-aware and self-reliant, drawing on their personal strengths and skills. They adapted their thinking and behaviour as they adjusted to their new roles. Many women used a highly relational approach to negotiating their transition. In addition to calling on specific relationships for support and guidance, the women placed a high value on forming and maintaining relationships within their organisations. Relational constructs such as credibility, reputation and validation, enabled the women to establish new relationships and navigate altered relationship dynamics. Many women also utilised a relational approach to learning their new job, drawing on the knowledge and expertise of team members and superiors. Access to this knowledge was conditional and required the women to adopt a humble and at times submissive position.

The participants also utilised organisational resources to manage their transition. Professional development built confidence and self-awareness and provided a symbol of transition to others within the organisation. A new position

in a visible and structured hierarchy communicated authority. Company policies were effective in maintaining women's participation in the workforce, however, this came at a cost for some women. Women who encountered additional structural barriers, including motherhood and overseas relocation, experienced an interruption to their transition. This was managed through the retention of technical expertise and by the oscillation between technical and managerial roles.

The gendered workplace terrain was negotiated using a blend of practices that both suppressed and embraced aspects of the women's gender. Techniques such as a continued emphasis on hard work and merit, a retreat from women-centred or 'feminist' initiatives or assimilation and alignment with accepted norms, were observed. In parallel, many women perceived their gender difference to be beneficial and adopted acceptable female stereotypes to their advantage.

6.8 Resolving and Reconceptualising

For the participants, making the transition to manager and leader involved phases of preparation, moving from a technical engineering role to one that encompassed broader business responsibilities, and encountering and adjusting to the new role within the gendered context of the engineering profession. This move to a broader role did not signal the culmination of the transition. Instead, the data revealed that becoming a manager and leader was a complex process that continued well beyond appointment to a particular organisational role. For many women, this process did not have a clear conclusion point; rather transition was a continuous thread of evolution, development and change woven into their career.

There are several indications that the women's transition into managers and leaders continued beyond appointment to the first role. Following their first managerial role, the women followed various pathways. Accompanying the move into managerial roles was a parallel internal journey of evolving self-perception. The perception of oneself as a manager or leader was not ubiquitous nor

complete, nor was it always aligned with the appointment to or working in the first management role.

This section begins by describing the pathways and self-perceptions that characterised the ongoing transition. The influences on this phase of the transition are then explored.

6.8.1 Transition Pathways

After entering the first managerial role, many participants did not follow a path of continued managerial responsibility. Some women remained in managerial roles, building their managerial experience; others moved back into the technical realm and pursued technical leadership. Several women described periods of having a foot in both camps and some were undecided as to their chosen direction at the time of interview. Many women experienced a combination of these pathways as their transition progressed. The variety of paths followed by the participants indicates that their transition to manager and leader extended beyond appointment to the first managerial role.

6.8.1.1 *"I ramped up my managerial experience" (M5)*

For some women, the initial move to manager was often followed by continued further experience as a manager with some consolidating or solidifying their experience in the same role, or similar roles, over several years. Others built their experience by working on bigger projects, taking on increasing responsibility and broader scopes of work. Additional avenues for building experience included difficult assignments or working in more challenging environments, such as regional locations.

"After that I came back into [current company]... I ramped up my management experience. I then had a team of about 8 people in [current company], about a \$4 million budget and that was pretty exciting." (M5)

A subset of those that continued to build managerial experience, were in fact undecided about their future prospects. Of interest, some women in this

category, despite holding a managerial role saw themselves as working on the 'technical side', rather than the 'managerial side'.

"I have a feeling that I'm quite close to the top of the technical side. So I don't know where I go after that." (M1)

6.8.1.2 *"I'd much rather stay on the technical side of it" (M22)*

Another group of participants returned to technical roles and established themselves in positions of technical leadership. Typically, these roles did not include line management or budget responsibilities. For a small number of the participants, this was a purposeful move. After spending time in managerial roles, these women chose to align with their strong technical preference.

"I decided that I can't lead the team anymore, I'd much rather stay on the more technical side of it. // So I'm not in the designated managerial position anymore, but I work very closely with my team leader to develop the technical skills of my team." (M22)

6.8.1.3 *"I'm trying to keep my feet in both camps" (M3)*

A final group of participants followed a path described as 'a foot in both camps'. This included women who had experienced the oscillation between managerial and technical roles as noted in section 6.7.5.1. In addition, were a small group of women who were working in managerial roles, but were undecided about whether they wanted to commit to a managerial path.

"I've struggled for a while with so I want to stay a technical specialist... or do I become a generalist and just become a strategic advisor across all different types of projects. So that's something I'm still not... I'm trying to keep my feet in both camps at the moment." (M3)

The indecision about whether to continue to pursue a managerial path was related to the degree of investment in technical expertise and the lure of technical work. This participant did not yet have a family, but was starting to consider this. Her subsequent comments implied that planning a family may be a reason for her

decision to keep her “feet in both camps”, with the view that technical roles offered a greater degree of flexibility.

“But on the other hand, it does tend to evolve by itself and if family life starts to come into it and you work less then... then who knows.” (M3)

6.8.2 Self-perception as a Manager, Leader and Engineer

All of the participants identified a point in their careers at which they considered that they had moved into a managerial or leadership position. However, this did not always coincide with their self-perception of being a manager or leader. Further, the identity of engineer was persistent and for some women, it remained dominant over their manager or leader identities.

6.8.2.1 “Manager. There’s not much engineering left.” (M17)

Some women readily identified with being a manager:

“Manager. There is not much engineering left.” (M17)

For others, recognising and accepting a manager or leader identity required time. One manager reflected:

“Not on appointment, that sounds weird doesn’t it.” (M4)

The same participant then went on to speak of a pivotal moment well into her appointment after which she did identify with being a manager and leader. A realisation that she would get sustainable results from her people by changing her approach highlighted her assumptions about management and leadership:

“It wasn’t all about the manager needing to know everything. That for me was a massive turning point.” (M4)

6.8.2.2 “I still try not to think of myself as a manager” (M1)

Other participants were ambivalent or reluctant about their managerial roles.

"I wouldn't care if they said: 'Look we've found [someone else] and you're not really the right person for this role and we'll move you back...' I wouldn't care. I just see where life takes me because it's been so good to me so far and I do like the technical stuff." (M6)

A small number of women did not perceive themselves as managers, continuing to hold strongly to their professional identity as an engineer, or were unable to target a point in time from which they perceived themselves as a manager or leader. One participant with 15 years of experience in managerial positions summarised:

"I still try not to think of myself as a manager... that's just part of the role as opposed to being solely a manager and that way I can live with myself. But is anyone asks me what I am, then I'm an engineer." (M1)

6.8.2.3 "It's a school of thought" (M4)

When speaking of how they saw themselves, their 'engineer' identity came across very strongly. Despite occupying management and leadership roles, several participants referred to themselves as engineers rather than managers/leaders. This was the case for women who were perhaps reluctant to assume a managerial role, or a manager identity like the woman quoted above, but also for those that perceived themselves as a manager.

"I still think that a lot of the way that your thinking is driven, especially in this industry, relates back to the engineering way of thinking. And I like that. And I profess to trying to hang onto that to some extent as I think that's something unique and valuable to me. And I encourage it in other engineers as well. It's a school of thought, rather than just a job title." (M4)

6.8.2.4 "I think I'm more of a leader than a manager" (M22)

A further group identified as leaders rather than as managers. This was typically the case for women who returned to technical roles permanently and pursued a technical leadership pathway, those that oscillated between managerial and

technical roles, or those that viewed themselves as senior engineers with managerial responsibilities.

Women who saw themselves as leaders rather than managers explained how they were regarded by others as technical experts in their area, or as people that would “know the answer” (M22). They were frequently approached for advice and invested in maintaining their expertise.

“It depends on what you call a leader but I guess I do always try to stay at the forefront of my field.” (M3)

Self-perception as leaders was also prominent in the accounts of military women who viewed the roles of manager, leader and engineer as an inclusive trilogy.

“I can’t be a good manager and leader without being a good engineer.” (M9)

6.8.3 Influences on the Continued Transition

The choices made by the participants and their identification as managers, leaders or engineers continued to be influenced by individual, relational and structural factors. The influences shaping this stage of the transition are presented in Figure 6.8:

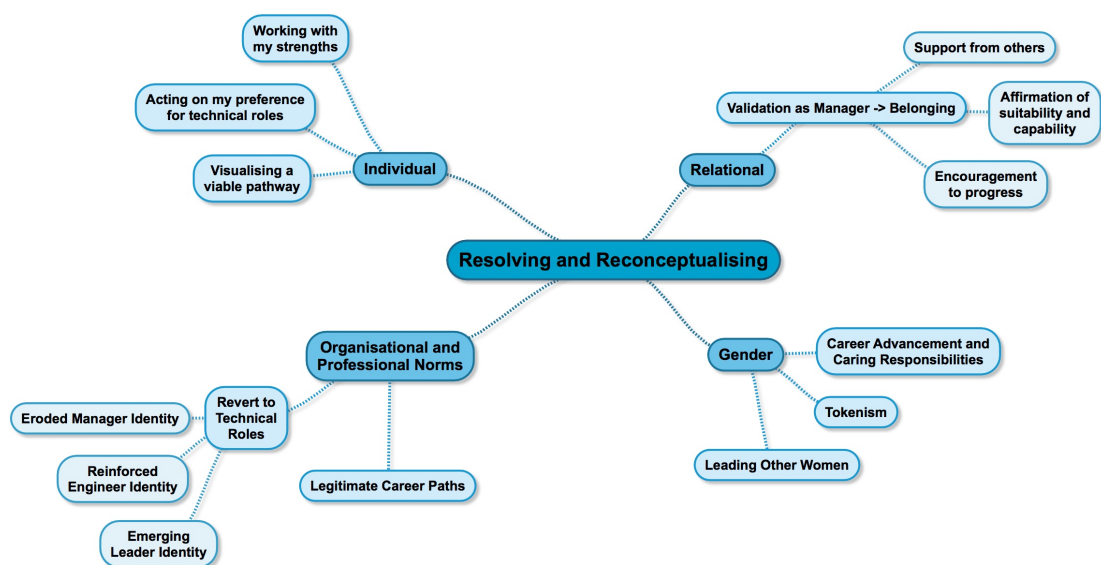


Figure 6.8 - Resolving and Reconceptualising: Influencing Factors

6.8.4 Alignment with Personal Preferences and Motivations

At the individual level, the transition was associated with the alignment with their preferences and fulfilment of their motivations. Again, the strong pull of technical work was evident and some women chose to return to the technical pathway. For others, the ability to see a future of self-influenced choices and self-perception resulted in choices that placed them on a managerial/leadership path.

6.8.4.1 *“A case of working to my strengths...” (P2)*

Many women were satisfied with their paths, feeling that the roles that they had moved to enabled them to work to their strengths, to align with their preferences and to satisfy motivations.

“I think it’s been a case of working to my strengths and also recognising when I need to change a situation.” (P2)

Women that remained within the managerial stream chose roles that aligned with their preferences. For example, those that wished to remain close to technical work pursued lead engineer or engineering management roles. Others moved towards more business-oriented roles.

“I like to remain close to the technical side of engineering... I’d like to move into engineering management so that it’s cross disciplinary and you’re looking more at the big picture and the whole process.” (P3)

Some women experienced a dissonance between formal managerial roles and their preferences. Those that were less enamoured with aspects of the role or had trouble identifying as managers reconciled this by relating to a more comfortable identity such as coach, guide or leader.

“I said I didn’t want to become a manager, because to me a manager wasn’t an engineer and how I reconcile myself to what I do now is... // If I don’t think about being a manager but more a sort of coach then I can cope with that.” (M1)

6.8.4.2 *"I decided that I can't lead the team anymore" (M22)*

The enjoyment and sense of achievement derived from technical work and engineering problem solving evident from early career for some women resurfaced in later career. A move back into technical roles resulted in greater job satisfaction for some women.

"I moved here to work in our sustainability group. Because sustainability's always been my passion. I was practising it before ESD was a known acronym."
(M8)

Some women encountered an intolerable level of challenge in their initial managerial roles. For some women, a strong technical orientation offered an alternative to challenges intensified by personal factors, a lack of support from others in the workplace, poor resource management or organisational change.

Relinquishing the responsibilities and workload associated with managerial roles, and returning to technical roles was a tactic used by some women to alleviate work-related stress.

"Basically I had a melt down and decided that I can't lead the team anymore, I'd much rather stay on the much more technical side of it." (M22)

Those that chose to continue on the technical path created informal and alternative pathways to leadership and ways of achieving recognition within their organisations. This included advocating for increased influence of technical people within their organisations.

6.8.4.3 *"I don't feel like I've got a career path where I am now" (P1)*

The visibility of the path leading to managerial roles was an important influence for some women in their move towards managerial roles. In a similar way, visibility of the next step, or the ability to see a future impacted on the self-perception and actions of the participants.

Those that could not see a desirable pathway, or one that was seen to align with preferences or fulfil motivations, were in danger of becoming derailed.

"I don't feel like I've got a career path where I am now... because I don't want my boss' job// I could go back to being more technical... there's just nothing there, there's no new challenges." (P1)

In contrast, a viable pathway, whether that was managerial or technical leadership, influenced identity development and subsequent choices.

"I have an aspiration to be a Technical Director which is, the next step up, and what I need to do that, I've been told that I need to meet all the financial targets this year." (M16)

6.8.5 Validation and Belonging

Validation emerged as an important influence as the women established themselves in their first managerial roles. It was also important to the ongoing transition process as it impacted the development of women's self-perception and identity and steered subsequent role choices and career direction.

Sources of validation included the support of others within the workplace (in particular from the immediate superior), the endorsement of the women's current situation and direction by others, and encouragement to pursue future opportunities.

6.8.5.1 *"I feel like there is a plan for the team that doesn't require my input" (P1)*

Relationships with others in the workplace provided practical support and guidance to overcome specific challenges, as described in section 6.7.2. Key to the ongoing transition process was the sense of belonging created by these relationships and the effect of this on self-perception.

An absence of support, particularly from the immediate superior, resulted in feelings of doubt, uncertainty and inauthenticity. Particular issues concerned a lack of autonomy, and unclear expectations of the extent of responsibility and

authority. Some women began to doubt their decision to move to and fit in a managerial role.

"I feel like there is a plan for the team that doesn't really involve, that doesn't require my input // I think I'd like to take this opportunity to exit gracefully..."
(P1)

In contrast, women with 'understanding bosses' who provided clear expectations of the role and inclusive opportunities did not describe these feelings of doubt and the support provided allowed them to develop a stronger self-perception. Instead their sense of place was reinforced. This also applied to organisational level programs such as senior level mentoring.

"Every month the Regional Managers... and a few other people from different areas who were in charge of stuff, we'd get together once a month and we'd go away every second month. That was really good fun as well." (M18)

6.8.5.2 *"You are not staying in the technical field" (M6)*

Affirmation of the women's suitability or capability in their current position or of their chosen direction was also important in identity development. Reassurance from others validated the women's decisions and reinforced that they were on the right path. This was particularly pertinent for women who were undecided or ambivalent about their current role or direction. One woman related a conversation that had taken place in an annual performance review:

"If I'm going to stay in the technical field, then I should go back and do a Masters... and he goes 'you are not staying in the technical field' so kind of said to me 'you'll be moving up'." (M6)

Actions of others served to reinforce the decisions of women who had chosen to pursue technical leadership roles. Being called upon for advice reinforces the leader identity for women in pursuing technical leadership roles.

"I'm quite often getting requests for inputs onto different proposals or projects, particularly on the [speciality] side of things." (M3)

6.8.5.3 *“Look, there’s a position advertised, are you interested?” (M13)*

A final relational influence on the ongoing transition process was the encouragement to pursue future opportunities. In a similar way to endorsement of the current position, encouragement of a future direction validated the women’s choices and strengthened developing identities.

One woman explained that she had been approached to shadow the CEO for a period of time. Being approached for this opportunity affirmed her past choices. The positive experience bolstered her self-belief and encouraged her to continue in her current direction.

“After that two weeks I thought “It’s not that hard actually what these Chiefs... it’s difficult the balancing all of that, but it’s not so far out there that you go ‘Oh my God, I could never do that.’” (M18)

Being encouraged to seek future opportunities was particularly important for women who had encountered situations that eroded their confidence or created uncertainty. For example, women who oscillated through technical and managerial roles, or were out of the workforce for a period of time were enabled by the encouragement to pursue more senior roles.

“There was a position that was advertised and I was on maternity leave with [Child 2] and they rang me and said “Look, there’s a position advertised, are you interested?” (M13)

6.8.6 Organisational and Professional Norms

The organisation and broader structural elements of the engineering profession influenced the women’s self-perception and shaped their pathways. Section 6.6.6 highlighted some structural elements that appeared to amplify the complexity of women’s transitions by creating a return to technical roles or oscillation between technical and managerial roles. In addition, the norms within the engineering profession, and within organisations, also influenced the ongoing transition.

6.8.6.1 *“Because I don’t have that management role, I don’t sit in the leadership team and yet I do feel that I have something to contribute there” (M5)*

Several women encountered structural obstacles in the form of constraining organisational policy, project-based engineering work and overseas relocation. These situations acted to interrupt the women’s management transition by requiring a return to technical engineering roles whether or not this was a preferred option.

This interruption had a tangible impact on the women’s career paths by directing them back to technical roles. Some women remained in technical roles and pursued technical leadership positions. Others experienced an oscillation back and forth between management and technical roles for a period of time. As noted in section 6.7.5, the ability to return to technical roles sustained the women’s transitions, albeit in an altered shape. However, moving away from managerial roles or working in part-time roles also affected the internal experience of the transition for some women.

Reverting to technical roles led to a loss of influence and impact that was frustrating. Some women were discouraged by the loss of influence, of no longer being part of decisions and losing their seat at the table.

“What I found frustrating and still find frustrating is there’s an issue about the level of influence. And influence within the organisation. So, I... because I don’t have that management role, I don’t sit in the leadership team and yet I do feel that I have something to contribute there.” (M5)

Other participants felt that they were being utilised at a level below their ability. For women in part-time technical roles, common frustrations included the sense of the lack of opportunities to advance their career, and an assumption that they were not interested in advancing their careers.

“I was given jobs that were suited to part-time work but had no sense that there was ever going to be any advancement in that role.” (P3)

Reverting to technical roles affected self-perception. Firstly, the value placed on the manager identity was eroded for some women. Requiring these women to revert to previous roles had an opposing effect to the validation stemming from belonging, endorsement and encouragement explored in section 6.8.5.

Secondly, moving back into technical roles reinforced the engineer identity. As noted in section 6.8.2.3, the engineer identity came across strongly in the interviews. The participants expressed great pride in being an engineer, more so than being a manager.

Thirdly, reverting to technical roles, even temporarily, prompted the development of an alternative 'leader' identity. From the frustrations associated with loss of influence and impact, some women forged alternative pathways of influence for themselves and with this a fresh self-perception. Some women achieved this through creation of relationships, others focused on becoming experts in their field.

"My influence tends not to be direct but indirect through the discussions that I do have with people that sit in the leadership team." (M5)

6.8.6.2 "To just broadly manage people and processes and things like that isn't a mainstream career path for an engineer" (M12)

Further influences on the ongoing transition process were professional norms. The participants spoke of mainstream or legitimate career paths for engineers. These career paths were value-laden, and the value placed on technical and managerial positions was dependent on the norms of the engineering profession and of the organisation.

As indicated in earlier stages of the transition, technical knowledge was a valued commodity. The value placed on technical engineers varied according to the focus of the organisation. In some organisations the archetype of the 'amazing engineer', an almost mythical, highly mathematical creature, was revered. In other organisations, this value was conditional. For example, in consulting

companies, technical engineers were highly valued if they generated or maintained an incoming work stream.

"If you're a good technical person and you've got the clients coming back to you again and again, and you're the go to person or the guru you can get up to the same sort of salaries that the major managers are on." (M22)

The data suggest that a tension exists between managerial and technical pathways. Despite technical reverence, the management path was typically considered to be the path of progress to achieve influence, organisational status, and income. In some cases this was because of the absence of substantial career pathways for technical people.

"If I really want to realise my potential I'll need to move back into management." (M5)

A formal role and recognition with a title did not hold personal value for many women but was perceived as required for navigating the organisation and for achieving their objectives through influence and impact.

"I don't personally think that it's super important but I think from surviving in an organisation point of view I think it is important. Because it is like most organisations... [Company Name] tend to be fairly flat hierarchy wise but there is definitely status associated with different levels and so on." (M3)

In addition, there were legitimate pathways for managers.

"Managing and general management in engineering is really either you have your own engineering company or you're the head of an engineering technical office, but to just broadly manage people and processes and things like that isn't a mainstream career path for an engineer." (M12)

These norms provided a message as to the legitimate pathways and presence within the women's organisations. Some women described a feeling of 'not fitting the mould' in the engineering profession. These comments related to a sense of being different from other engineers. This included having additional

qualifications such as a PhD that were perceived as unusual or threatening in the engineering context, having a background in a less traditional engineering discipline, or having a desire to move away from the 'mainstream' career path.

6.8.7 Gender and the Continued Transition

Being a woman in a gendered profession within gendered workplaces continued to shape the women's experiences of managerial and leadership transition. Woven through their journeys of organisational progression and evolving self-perception were gendered tensions and challenges that did not abate as women moved into senior organisational roles.

6.8.7.1 *"It's hell. It's very, very hard" (M21)*

As detailed in section 6.6.5, becoming a mother added complexity to the women's transition journeys. While it did not preclude all women from continuing to work as managers and leaders, caring responsibilities did influence the transition in several ways. Some women oscillated between managerial and engineering roles. Others remained in managerial roles but lamented a lack of progress during this time or described distressing levels of tension in maintaining career advancement in addition to their caring responsibilities:

"It's hell. It's very hard. Very, very hard when you've got two kids and you're still the primary carer. Whenever anybody says, "Women always" – 99.9 % of the time, you're still the primary carer even when you've got two of you at work." (M21)

An interesting contrast in attitude was seen with women working the defence sector. Two of the three women interviewed in this sector were at a senior level. They felt that they could manage their careers and family commitments, suggesting the influence of detailed and clearly understood organisational structures and norms.

6.8.7.2 *"Is it a bit of tokenism?" (M13)*

Beyond the frictions associated with motherhood, the participants continued to emphasise themes of merit, competence, hard work and visibility described in earlier transition stages. Several women described progressing to senior management roles under the shadows of affirmative action, positive discrimination and tokenism. One woman expressed uncertainty of having progressed senior roles as result of their own efforts.

"I don't know how much of all this along my career is because, 'Oh, we've got a female, we've got to tick the box.'" (M21)

In contrast, another senior manager felt that others that did not know her may link her progress to tokenism.

"I think the people that have worked with me and know me and know how I work and what I have achieved don't see it as... just see it as the next step. It's just the next step. For others who don't know me and think, you know, "is it a bit of tokenism?" and stuff like that, but I think being female in such a male dominated environment, you will always get that." (M13)

Women were loath to feel that they had been promoted to higher positions because of their gender. As a result, some women described an ongoing need to prove themselves not just for themselves but also for others in each and every subsequent role. The same senior manager explained:

"I have to prove myself on so many different levels in the sense that I'm female, in the sense that I'm primary caregiver for my kids, I work part time therefore if I stuff it up what does that do, not just for other females, but for me it's other males as well because it's a family friendly working environment, supposedly, and everything else." (M13)

6.8.7.3 *"I can't say yes to another request about female mentoring or guidance or lecturing or somebody wanting to come and do work experience with me."*
(M11)

Being one of few women at very senior organisational levels brought additional responsibilities prompting mixed feelings. Assuming role model status for other women was described in positive terms as 'leading other women'. One woman reflected that this commenced in early career, by virtue of being a woman engineer – a visible minority in the profession. Other participants viewed their presence in senior roles as helpful and expressed a need to help other women engineers.

Women's minority status at senior organisational levels was described as a burden, due to additional workload. One participant ran the women's network in her organisation. She viewed this as an important function for other women in the organisation, but viewed the role as time-consuming and draining. Another executive level woman described additional activities as a "cultural overhead" which took her away from her primary role. She explained that senior women experienced a disproportionately higher workload due to activities including participating in surveys and interviews, providing input to organisational initiatives, and sitting on promotional committees:

"Being a woman now is a benefit in some ways, but it's also a profound drawback, because there aren't enough women, and so, you tend to get stung for every bloody thing going, you know!"

Your cultural contribution is much higher, because you are in the minority.

I think that creates a significantly higher workload for senior women.

Which isn't recognised, can I say. Not recognised at all. And there are moments when you just say, 'I can't be a Girl Scout anymore. I can't say yes to another request about female mentoring or guidance or lecturing or somebody wanting to come and do work experience with me.'" (M11)

6.8.7.4 Gender and Identifying as a Manager and Leader

Gender remains a contested space regardless of how long women have been in managerial and leadership roles. Participants drew on established gendered metaphors or stereotypes to make sense of their experiences as they became managers and leaders. These were rarely challenged. As discussed earlier, these included granddaughter-grandfather or daughter-father relational roles with older male colleagues, and mother-child relational roles with team members. Accompanying this was reference to a mutually exclusive woman-manager/engineer dichotomy, in which participants wished to be perceived as managers or engineers, rather than women.

Respondent: "I don't want to be, "Oh, you know, she's just a..."

Interviewer: "The woman manager?" (M21)

Thus, as women continued their transition, identifying as a woman manager and leader in engineering was a fraught identification that for many remained unresolved.

6.8.8 (Un)Resolving and Reconceptualising – Summary

The transition to manager and leader did not conclude with the appointment and adjustment to the first managerial role. For most women, it was a process that encompassed multiple organisational roles, both in technical and managerial realms. Participants described variations of career progression, most of which did not align with 'full-time, straight line' advancement.

Becoming a manager and leader also encompassed changes in manager and leader identity. Self-perception as a manager or leader was not consistent, nor was it coincident with organisational role, and a persistent engineer identity was noted. These differences highlight disparity between professional identities that are claimed and granted by others.

At the individual level, the same factors that had kindled initial aspirations to move to broader, more senior roles such as personal preferences and

motivations, continued to influence subsequent choices and self-perception. Validation and belonging re-emerged as important relational influences. The ongoing transition was bounded by organisational and professional norms as well as gendered expectations of self and others.

Women continued to encounter incongruences between personal work desires and expectations), out of work responsibilities, and organisational and professional norms regarding workload, legitimate career progression and paths generating tensions. Further, concerns regarding tokenism and affirmative action threatened legitimacy, and the pressures of additional gendered 'culture work' exacerbated workload issues.

Although this phase of transition suggests a sense of resolution and completion, this was not the case for many women. The tensions described in this and previous sections remained largely unresolved. Ongoing negotiation of challenges and tensions was required. Further, the transition to manager and leader was commonly unresolved. The ongoing transition emerged as a continuing process, taking many forms, and without a clear point of culmination and completion for many women.

The fluid, complex, convoluted and gendered nature of the transition experience suggests a reconceptualisation of the transition from engineer to manager and leader by adopting a more flexible, holistic and inclusive view.

6.9 Chapter Summary

This chapter continued the reporting of findings from interviews with 22 women engineers working as managers and leaders in Australian organisations. The women's experiences of transition to manager and leader are illustrated by ten key themes that emerged from analysis, organised against a temporal framework of 'transition phases'.

The 'transition phases' present the transition as a five-phase journey, extending before and beyond appointment to their first management and leadership role. 'Getting Started' focused on the influences active prior to the first managerial /

leadership appointment. The opportunities, triggers and decision to make a move to a managerial to the first manager/leader position are explained by 'Making a Move'. 'Encountering Change and Challenge' described the new dynamics, responsibilities and expectations that accompany the change in organisational role. 'Negotiating the Environment' explained how the women reacted and adjusted to the many changes and challenges encountered upon moving in to their new role. The ongoing, convoluted and commonly unresolved nature of the transition to manager and leader is captured by 'Resolving and Reconceptualising'.

The discussion of the findings is presented in Chapter 7. Moving beyond the key themes, a conceptual model of the transition phenomenon is presented, emerging from reflection on the interconnections between the key themes within a context where both gender and identity of manager/leader remains contested. The model moves towards capturing the essence and complexity of the women's transition experiences.

7 Discussion

7.1 Introduction

"The story is not especially neat, or straightforward." (Hill, 1992).

The findings presented in Chapters 5 and 6 provided an understanding of how the women perceive the role of manager and leader within the engineering profession and their experiences of progressing to these positions.

Chapter 5 presented a demographic description of the participants and the findings relating to women's conceptualisation of manager and leader within the engineering profession. Initial managerial and leadership roles were varied, but common transitions involved taking on responsibility for projects or programs, or teams of engineers and other technical professionals. Participants described their purpose as managers and leaders as delivering a capability, achieved through interlinked relational, organising and technical functions. They emphasised a highly relational approach, focused on responsibility for and relations with others. They described other - mainly male - managers and leaders within engineering, with an overt emphasis on commercial acumen, in addition to interpersonal and technical proficiency. 'Other' managers and leaders sought to display their commitment to the organisation and visible leadership through their influence and motivation of others, whilst for most of the study participants this was achieved in less overt ways.

In Chapter 6, the nature of the women's transition experience was presented. The ten key themes that emerged from phenomenological data analysis of the participant's experiences were interpreted against a temporal framework of 'transition phases'. This framework highlighted the key stages in the women's transitions. The foundations and reasons for their transition, the changes and challenges that accompanied their new role, and the ways in which the women reacted and adapted to these were shaped by individual, relational and structural influences, within the gendered context of the engineering profession.

This chapter presents a discussion of the findings and their points of intersection

and contrast with existing literature. Areas of contrast are particularly relevant for the study's key contributions to theory and practice, presented in the concluding chapter.

The discussion serves to answer the research question driving this study that asked: "How do women engineers transition into managers and leaders in technical organisations?"; and to fulfil the study objectives which were to:

- understand the experience of transition to manager and leader for women engineers;
- understand how management and leadership in technical organisations is conceptualised;
- uncover the factors that affect the transition to manager and leader for women engineers; and
- identify implications for individual and organisational practice to advance women in engineering.

The discussion of the findings is guided by the *Transition Continuum Model* shown below in Figure 7.1. Reflection on the interrelation of the themes that emerged from the data led to the development of this conceptual model that illustrates the women's experience of transition and expresses the complexity of their experience. It has been developed through a process of further analysis, reflection and reduction as is common in phenomenological analysis. Moustakas (1994) writes of locating the essential structures of a phenomenon, while Halling (2008) in Finlay (2009b) suggests undertaking multiple levels of analysis, from particular experience to universal qualities, to fully access and understand the lived experience.

This chapter begins with an overview of the *Transition Continuum Model*. The points of difference and similarity to existing role transition and career advancement models are discussed. This is followed by a discussion of the model's representation of women's transition as an experience across three dimensions: as an often convoluted external journey, accompanied by an internal psychological experience, occurring over time. The discussion presented in

Section 7.3 realises the first research objective: ‘to understand the experience of transition to manager and leader for women engineers’. The triad of influences that act concurrently and interactively to shape and form the women’s transition experiences are discussed in Section 7.4. This discussion relates to the third research objective: ‘to uncover the factors that affect the transition to manager and leader for women engineers’.

The final section of the discussion examines the perceptions of management and leadership, and manager and leader, in the engineering profession. Section 7.5 relates to the second research objective: ‘to understand how management and leadership in technical organisations is conceptualised’.

7.2 The Transition Continuum Model – an Overview

The *Transition Continuum Model* presented in Figure 7.1 illustrates women engineers’ experiences of transition to manager and leader. In contrast to linear or cyclical processes described in existing work-role transition concepts (Forrier, Sels, & Stynen, 2009; Ng, Sorensen, Eby, & Feldman, 2007; Nicholson, 1984; Nicholson & West, 1988), the continuous spiral of the model captures the complex and dynamic nature of the transition experienced by the women in this study.

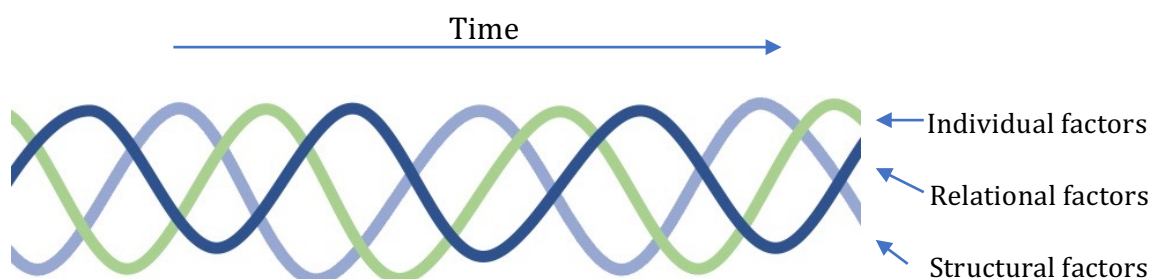


Figure 7.1 - The Transition Continuum Model

The *Transition Continuum Model* has a triple helical shape, consisting of three interwoven strands. Each strand represents a key element of the women’s transitions described in the findings presented in Chapter 6. These are i) individual, ii) relational and iii) structural elements. These elements, and the interfaces between them, describe the factors that determine, support and constrain women engineers’ transitions to manager and leader. The strands also

capture the way in which the women engage with the process of transition - their actions, reactions, behaviours and priorities. While an experience is personal and individual, the entwined strands indicate that the women who experienced this transition did so in relation to others within the highly gendered structures of their organisations, their profession and the broader social context.

A cross section of the *Transition Continuum Model* is shown in Figure 7.2. The interlinked strands of the triple helix create an external surface and an internal space. These surfaces represent the dualism of the transition experience - the external experience represented by changes in organisational role or position that are visible to the outside world, accompanied by an internal, personal and inwardly visible journey. The external and internal experiences are co-constructed and dependent. The external experience influences the feelings, thinking and identification that characterise the internal journey; the internal journey informs the individual's behaviour and actions, which are manifested externally.

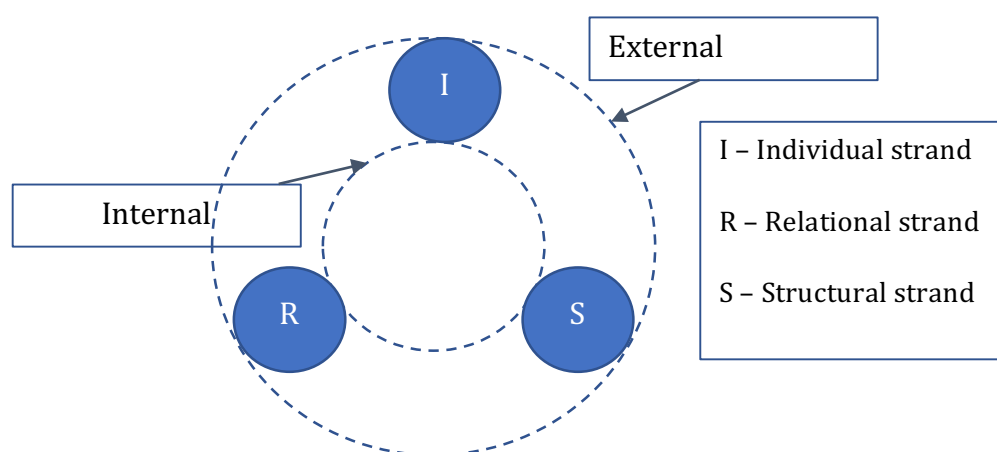


Figure 7.2 - External and Internal Dimensions of Women Engineers' Transition to Manager and Leader

Outwardly, the transition to manager and leader is marked by an organisational role change, or series of role changes, role-related opportunities and decisions. The *Transition Continuum Model* reflects the finding that for many women the transition to manager and leader was not experienced as a single change in role

from technical engineer to manager. Instead, it encompassed several roles, often in multiple directions within one or more organisations, over an extended period.

The internal experience of transition acted in tandem with the external experience. Changes in organisational roles and responsibilities were accompanied by a process of encountering and negotiating changes and challenges associated with those new roles. This is the personal and psychological journey of becoming a manager and leader. Consideration of both the external and internal dimensions of transition highlight that the external and internal experiences are often quite different, and are not necessarily aligned.

The spiralling nature of the helical shape represents the temporal dimension of transition. The women experienced transition to manager and leader as a multi-phased process unfolding over time. The transition phases presented in Chapter 6 indicate that for these women, the transition from engineer to manager and leader was not experienced as a change in position within an organisation occurring at a moment in time, rather as a process originating prior to appointment to the first managerial role and extending well beyond this first role.

7.2.1 Contribution of the Transition Continuum Model to the Understanding of Work-role Transitions

The *Transition Continuum Model* shows that to understand women engineers' transition to manager and leader, the dimensions and influences must be considered as a dynamic system. Thus, transition is conceptualised as a multi-stage and frequently multi-directional process that extends prior to and beyond appointment to the first managerial role, often without a clear conclusion point. Accompanying the role change, or the series of role changes, that outwardly signal a transition to management and leadership, is an internal journey of change, challenge, tension, adaptation, adjustment and identification. The triad of individual, relational and structural influences shape the outward and inward experiences that unfold over time.

The scope and dynamic nature of the participants' experiences of transition and advancement are not captured by existing work-role transition models, including

those relating to women's advancement to senior roles and advancement within the engineering profession. Current models and concepts can inform some of the findings in this research, but they do not adequately express the complexity and fluid nature of the transition experience described in this research.

Movement from one role to another is central to the concept of career (Cohen, 2014) and "transitions are the essence of how many people describe their careers" (Arnold, 2012, p. 11). Existing work-role transition models may focus on one aspect or stage of the transition (Forrier et al., 2009; Louis, 1980; Ng et al., 2007; Nicholson, 1984). Others recognise transition as a multi-stage process, culminating in a period of stabilisation or by reaching a point of equilibrium (Forrier et al., 2009; Nicholson & West, 1988). The reaching of a point of equilibrium contrasts with the findings of this research.

A key finding of this research is that transition to manager and leader extends over multiple roles. This contrasts with prevailing models that focus on a single work-role transition from Role A to Role B (Forrier et al., 2009; Ng et al., 2007; Nicholson, 1984). The connection between a series of roles is recognised by Forrier's (2009) observation of "cyclical development of career trajectories over time" (p. 752) in which the move to new work-role is both the ending of one transition and the start of another, and the extension of Nicholson & West's transition cycle model by Ashforth (2001) to represent the experience of a series of "similar or integrated" roles (termed as 'between-role transition cycles'). However, this is different to the conceptualisation of transition to manager and leader as shown by the *Transition Continuum Model* in which transition can be seen as an overarching, ongoing process that often experienced over several role moves.

A further point of difference of the *Transition Continuum Model* from the existing understanding of transition to manager and leader is the entwined nature of the external and internal transition experiences. The psychological aspects of work-role transitions are recognised by the adaptation and sense-making processes described by Louis (1980) and Nicholson (1984) and are the focus of work by Ashforth (2001) and Ibarra and colleagues (Ibarra, 1999, 2003; Ibarra &

Barbulescu, 2010). However, the influence of the external and internal dimensions on each other, particularly with regards to transition as a process occurring over multiple roles, is not well captured.

Finally, central to the *Transition Continuum Model* is the entwined and interactive nature of individual, relational and structural influences. Interplay of influences within the context of role transition is recognised by other researchers. Both Ng et al. (2007) and Forrier et al. (2009) propose that despite recent focus on the boundaryless career (Arthur & Rousseau, 1996) and on agency as a primary driver of voluntary job transitions, career-related moves are also highly influenced by structural factors. Multi-level influences are also identified by Seethamraju (1997) in the engineering context and by Ragins and Sundstrom (1989) and Tharenou (1997) in relation to women's career advancement. A major difference between the findings of this study and existing frameworks is the role of relational factors in shaping the transition. While relational aspects are incorporated into existing frameworks through elements such as social capital, values and norms, and ease of movement (Forrier et al., 2009), the extent and dominance of their influence on women engineers' advancement to manager and leader has received little attention.

These high-level points of difference between the *Transition Continuum Model* and concepts that shape the current understanding of women engineer's transition to manager and leader are discussed in more detail in the following sections. The following discussion aims to extend the understanding of women engineers' advancement to senior roles by examining the links between previous research and the unique features and points of difference identified in this research of the participants' experiences.

7.3 Transition as a Multi-Dimensional Experience

Women engineers' transition to manager and leader was experienced across three dimensions: the external manifestation of advancing to management and leadership roles within an organisation and the associated internal journey, unfolding over time. The pathway to manager and leader was highly varied.

Women engineers commonly experienced their transition to manager and leader over a series of organisational role changes in multiple directions, rather than a single upward role move. Accompanying this multi-stepped path was an extended internal journey of adjustment and identity formation. The internal dimension of the transition to manager/leader occurred in parallel, but was not necessarily synchronised with the visible, external transition.

Women engineers' transition to manager and leader was a process commencing in and influenced by early career experiences. The protracted nature of the transition and disparities between external and internal experiences, make the culmination of the transition difficult to define. Instead, the transition experience is presented as one of continued becoming and adaptation, questioning the existence of a state of managerial or leadership being.

7.3.1 A Multi-Stepped Transition

Transitions were characterised either by the building of managerial experience over a series of roles or by the retention of technical work while taking on broader responsibilities. Transition to manager and leader as a process aligns with Seethamraju's conclusion that the transition to management for engineers is a continuous process, rather than a sharp delineation between engineer and manager roles. The combination of technical and managerial tasks, and the gradual broadening of roles further supports research that has identified the integrated nature of engineering and management work (Seethamraju, 1997), and the prevalence of technical coordination in engineering work from early career (Trevelyan, 2007, 2010).

Women's advancement to manager and leader was also frequently multi-directional and reversible, characterised for some by a specific pattern of oscillation in and out of managerial and technical roles. The nature of women engineers' transitions contrasts with previous perspectives on engineering work that posit that "a person is either a manager or an engineer: the former has little or no technical content in his work and the latter has little or no social dimension

to his work” (Trevelyan, 2007, p. 192), and with traditional view of advancement as a continuously upward and linear path (Ng et al., 2007).

Greater flexibility and diversity within career journeys are recognised in ‘new’ career models, including boundaryless, protean, academic and post-corporate frameworks (Arthur & Rousseau, 1996; Baruch & Hall, 2004; Hall, 2004; Peiperl & Baruch, 1997) and newly emerging career paths are increasingly “multi-directional, dynamic and fluid” (Baruch, 2004, p. 59). However, there are important differences between the movements within the women’s transitions and new career patterns. The multi-directional role moves by the women occurred within the context of traditional advancement through organisational hierarchies. That is, upward advancement and upward mobility, rather than new career patterns, remains the dominant success model within engineering organisations. As described in Chapter 2, alternative pathways to traditional career ladders do occur within the engineering context. These offer flexibility, but are not as desirable nor associated with advancement, power or organisational rewards (Allen & Katz, 1992; Bailyn, 1991; Ng et al., 2007; Tremblay et al., 2002).

Further, multi-directional movement was not agentic nor due to greater individual control over career choices (a characteristic of new career models). Instead, it was a result of structural influences such as the project-based nature of engineering work, organisational policies related to part-time work and managerial roles, and international relocation. These factors directed women’s advancement away from the traditional, linear and accepted route and acted to slow or divert their progression on this pathway. This finding suggests that to understand the experience of advancement for women engineers, the structural influences shaping the transition must be considered.

The multi-directionality of women’s advancement within engineering presents an interesting paradox. While the oscillation in and out of managerial and technical roles can be perceived as a barrier to career progress as it deviates from the traditional view of advancement, switching between managerial and technical roles may enable the negotiation of obstacles, particularly in relation to

the gendered environment, and continuation in valued employment. Women's career paths are noted to be different to men's (O'Neil & Bilimoria, 2005). The multi-directional role moves experienced by the women in their pursuit of advancement resonate with the metaphor of the labyrinth of leadership (Eagly & Carli, 2007). The labyrinth describes the "complexity and variety of challenges that women can face in their leadership journeys" (ibid p. 3) and connotes their convoluted path towards senior management and leadership positions. There has been little attention paid to downward mobility (Ng et al., 2007) suggesting that the pattern of oscillation warrants further research and attention.

7.3.2 The Internal Journey

The internal experience of transition to manager and leader was characterised by feelings, and changes to thinking and self-perception that accompanied changes in work role and position with the organisational hierarchy. Tensions stemming from role-related challenges abated, but for many women gendered tensions remained unresolved. While all women could identify their first managerial/leadership role, not all women could identify the time at which they considered seeing themselves definitively as a manager or leader. A range of coexisting professional identities were developed.

7.3.2.1 *Transition as a Conflicted Experience*

The move into management evoked predominantly positive emotions. However, it was accompanied by stress and tension resulting from the challenges and changes encountered. Feelings of pride and accomplishment sat with anxieties stemming from role ambiguity and complexity, altered relationship dynamics and misalignment between expectations and reality. New experiences and altered relationship dynamics prompted changes to thinking and behaviour. Becoming a manager and leader involved acknowledging and altering preconceived ideas of what management and leadership was, and adjusting a narrow, individual focus to a broader, collective thinking.

Transition as a conflicted experience prompting learning, acquisition of new perspectives and attitudes is consistent with previous work exploring the

transition to management generally and within the engineering profession (Howard, 2003; Plakhotnik, Rocco, & Roberts, 2011; Wilde, 2009). There is a period of adjustment and sense-making that occurs. Louis (1980) suggests that the transition experience is defined by differences between anticipated and experienced reality. Coping with these differences is at the centre of the transition process.

Hill (1992) describes a priority for new managers as “learning to cope with the stress and intense emotion associated with their new position” (p. 7). The examination of women’s transition experiences within highly gendered engineering workplaces suggests that in addition to transformation and role related challenges identified by Hill, the highly gendered environment is a further source of tension that is not considered in Hill’s study or captured by adjustment and sense-making schema. Further, gendered tensions remain largely unresolved even as women progress to senior organisational positions.

As women moved through their transition journey and into more senior management and leadership roles, encountering restrictive gender roles and uncertainty around differential treatment lead some women to question the gendered nature of their work-related experiences. Variance in awareness or acknowledgement of gender dynamics in engineering workplaces is consistent with previous studies that have found women engineers to be accepting of gender discrimination and as viewing their workplaces as gender-neutral (Faulkner, 2009b; Powell, Bagilhole, & Dainty, 2006) or recognising gender as both a first a benefit and then a hindrance to career progression (Dainty, Neale, & Bagilhole, 2000). These uncertainties and questions generated a sense of ‘otherness’ that participants attempted to mitigate through a range of behaviours including focusing on merit and hard work, suppressing of the feminine, adopting accepted female stereotypes or archetypes, and internalising stress.

The focus on hard work, competence and being judged on merit that extended throughout the transition journey marries with Faulkner’s findings that women engineers have to “(re)establish their engineering credentials” (Faulkner, 2009b, p. 174) continuously through their careers, and that they perform additional

identity work throughout their careers in order to be taken seriously as engineers. This research suggests that this extends to women engineers in management and leadership roles.

Being taken seriously for engineering abilities and feminine looks and behaviours were presented as a mutually exclusive dichotomy. Those that did acknowledge feminine qualities did so by framing organisational relationships within accepted female archetypes such as daughter and mother. These findings reaffirm those of several women in engineering studies (Bastalich et al., 2007; Gill et al., 2005; McIlwee & Robinson, 1992; Mills et al., 2006) that discuss strategies used by women engineers to mitigate with the challenges of the engineering workplace. This research extends these findings by suggesting that even having risen to positions of influence within their organisations, women continue to have difficulty in reconciling femininities within the engineering workplace.

7.3.2.2 Transition as the Coexistence of Identities

In addition to coping with the challenges of moving to new organisational roles, the transition to manager and leader also encompassed reflection upon and changes in self-perception. The literature review presented at the start of this thesis established that transformation of professional identity – from specialist identity to a manager’s identity - is recognised as a key process of becoming a manager (Hill, 1992; Plakhotnik et al., 2011). For the women in this study, self-perception as a manager or leader did not often coincide with appointment to the first managerial role. Identification with a new role occurred over time, and the point at which women related to their new role was highly varied. Interestingly, identification as manager was not dependent on occupying managerial roles even for significant periods of time. Identification as an engineer was a strong professional identity that was retained, rather than swapped for a managerial identity. This contrasts with previous research on managerial transition that indicates that “that to exit one role and enter another is to switch personas” (Ashforth, 2001, p. 51) or that new managers begin to adopt a managerial identity as they begin to act like managers, and that this is likely to commence after the first 6 months of a new role (Hill, 1992; Plakhotnik et al., 2011).

A surprising finding was the range of identities that the women held relating to enacting management roles. In this research, the role of manager and leader and transition did not always involve developing a 'manager' or 'leader' identity. Some viewed themselves as managers, others saw themselves as leaders, some described a persistent engineer identity whilst others spoke of an integrated identity of engineer, manager and leader. Varied identifications with the role of manager are noted by Parker (2004). In his reflexive account of becoming a manager within the academe, he challenges the existence of a hegemonic managerial identity stating "I don't want to assume that the identity or occupation of a manager is fixed and final, or that it means the same thing to everyone that is attached to it" (p. 45). This research indicates a coexistence model suggesting the existence of a range of professional identities rather than the development of identities that are mutually exclusive.

Social identity theory (SIT) (Tajfel, 1982) can help to explain the range of professional identities held by the women, particularly the lack of identification as manager and the persistence of the engineer identity. SIT theorises that the process of identifying with a group involves cognitive, evaluative and emotional components. For new managers, this involves recognising that they are part of the 'manager' group, attaching some value to, and placing importance on or making an attachment to membership of this group (Plakhotnik et al., 2011). The varied degrees of engagement with each component can provide insight into the different identifications that the women hold. Women who hold a managerial identity may connect with the role on cognitive, evaluative and emotional levels, while those that recognise alternative group memberships, such as engineer or leader, may see being a manager as inevitable or unenjoyable (low evaluative identification) or as having low importance to their self-concept (low emotional identification). Further, the exclusion of women from the 'manager' group and constant reminders of their 'otherness' (Gherardi, 1994) may impact their recognition of belonging to the manager group and further weaken their sense of managerial identity.

The persistence of a previous professional identity has been noted in research examining the process of becoming a manager. In his study of project managers,

Paton, Hodgson, and Cicmil (2010) recognised that professionals from established disciplines such as engineering perceived the title of 'project manager' to be less respected and understood by peers. To negotiate this tension, some project managers "engaged in quite complex identity politics" (p. 162) and reverted to previous occupational titles or professional affiliations as they were perceived to be more credible. As an academic, Parker (2004) noted that "like other professionals in large organisations (doctors, engineers, lawyers) I have a somewhat divided series of identifications" (p. 56). Varied levels of connection with a managerial and leadership identities may indicate inherent values within the engineering profession, or resistance to traditional notions of management and leadership by engineers (Rottman et al., 2015).

For women engineers, the identity of engineer may be particularly pertinent. Women who persist in the engineering profession are more likely to express an identity as an engineer than those that opt out of the profession (Buse et al., 2013). Research on women in engineering suggests two reasons for this. Firstly, is the work required by women in claiming an engineering identity, or being seen as a credible engineer, given the male dominance and masculine culture of the profession (Mills et al., 2014). Gill et al. (2005) highlight the identity work associated with being a woman in engineering and the compromise of a sense of self in order to be accepted within the profession. The engineering career is depicted as one peppered by difficulties and obstacles. Advancing to senior roles such as manager and leader indicates that the women have negotiated these obstacles in their career, and that their success is hard-won. Secondly, is the sense of uniqueness and attention gained from being one of few women in engineering. This celebrity may not be easily replaced (Powell et al., 2006). Therefore, relinquishing the associated professional identity may not be straightforward and an attachment to the engineer identity is perhaps not surprising.

The engineering identity is further reinforced for women who follow a convoluted and oscillating transition path. Ashforth (2001) states that "individuals craft identity narratives that foster a sense of coherence and progress as they journey through various and possibly diffuse roles over time" (p. 226). Structural factors that channel women back into technical roles

emphasise their belonging in such roles, while marginalising their belonging in the managerial and leadership realms. This is an interesting contrast to research that suggests the difficulty of belonging in engineering for women (Faulkner, 2009b; Hatmaker, 2012). In this study, the technical engineering space may be more comfortable, while, echoing Faulkner (2009b), establishing a position in the more senior echelons of the profession requires further gender and professional identity work. Further, it emphasises the role of organisations and broader professional structures in identity development.

7.3.3 Over Time

As evidenced by the discussion of the external and internal dimensions of the transition, women engineers' transitions to manager and leader were not experienced as a single work-role change. Instead, the transition was a process originating prior to the first management and leadership roles, extending well beyond the day of appointment to this role and often enduring through a number of organisational role moves. The temporal dimension of the participants' transitions is captured through the continuous nature of the *Transition Continuum Model* shown in Figure 7.1 and the transition framework of 'Getting Started', 'Making a Move', 'Encountering Change and Challenge', 'Negotiating the Environment' and 'Resolving and Reconceptualising' presented in Chapter 6.

Previous research has perceived career related transitions as a process occurring over time (Glaser & Strauss, 2010; Louis, 1980), reinforced by a focus on transition adjustment processes (Ashforth, 2001; Ibarra, 1999; Nicholson & West, 1988). While the temporal nature of transition is acknowledged, there are several differences between the findings of this research and existing knowledge pertaining to career-related transitions, including studies specific to managerial or leadership transition and the experiences of women.

The extent of the transition process that emerged from this study is not captured by a single existing concept. There are similarities to transition cycle model presented by Nicholson (1984) and the 'engagement and enactment of leadership' framework presented by Lord (2007) that consider transition or

movement to new roles as a multi-stage process. Key differences to these concepts relate the beginning and ending of the transition, that is: the bearing of early career experiences on the women's transition and the point of conclusion of the transition.

These differences highlight the ambiguity of the start and finish points of a work-role transition. Arnold (2012) suggests that a transition begins "when a person starts to devote significant cognitive, behavioural and/or emotional resource to preparing for a transition, or to seeking one" (p. 6) and a transition ends when "further cognitive, behavioural and/or emotional changes a person encounters or initiatives are experienced as fine-tuning of an essentially stable situation" (p. 6). The findings of this study suggest that experiences prior to the point of preparing for or seeking a transition must be considered in order to fully understand the transition to manager and leader, and that the ending of the transition is difficult to define.

7.3.3.1 Beginnings

The importance of experiences prior to seeking or being offered the opportunity to move to a management role highlighted in this study are not captured by current frameworks. The transition from engineer to manager is influenced by experiences and interactions prior to the role change that lay the foundations for transition and inform the decision to make the move to a managerial or leadership role. While Nicholson (1984) recognises a phase of 'preparation', this phase is focused on psychological readiness and anticipation, suggesting that preparation begins once a move to a new role is planned. In Lord's (2007) four-phase model of leadership transition, 'Stepping' recognises the triggers and motivations for academic women deciding to undertake a leadership role within their university. This is analogous to the phase of 'Making a Move' in this research's experiential model.

The construct of 'movement capital' presented in the career mobility model by Forrier et al. (2009) can inform the relevance of experiences prior to moving into the first managerial role. Movement capital encompasses agentic aspects that

influence career decisions. According to the authors, the extent of an individual's movement capital impacts their readiness to make a career movement, and is comprised of i) human capital, ii) social capital, iii) self-awareness and iv) adaptability. Further, the building and maintenance of movement capital can be achieved through a range of activities, and is influenced by opportunities to access and the willingness to participate in such activities. This research also identified factors that act as foundations for transition. In addition to those identified by Forrier, greater consideration of the role of others (relational factors) in amassing one's movement capital and readiness to advance is required to gain deeper understanding of the transition process. The influence of specific factors on the women's transition is discussed later in this chapter.

7.3.3.2 Timing of Managerial and Leadership Responsibilities

All women in this study can identify the first role with which they assumed managerial or leadership responsibilities. The time at which this role change occurs in women's careers is varied, as are the patterns of their preceding work history. Two forms were observed - firstly, a transition within the first few years of work; secondly, a slow onset transition, which followed a steady accumulation of experience including working through a variety of roles. Within the engineering profession, engineers assume managerial responsibilities after an average of 5 years (Srouf et al., 2013). This research indicates that early transitions are driven primarily by structural factors such as organizational norms, while transitions occurring later in career rely more on individual and relational triggers.

The later transition pattern may reflect women's practises of ensuring adequate experience and relying on "substance over form" (Ibarra, 1999, p. 778). Later timing may also reflect a reduced desire by women engineers to achieve these positions (Dolan et al., 2011). As reported in the findings, most participants possessed general career ambition, but did not directly verbalise the desire to pursue management and leadership positions. This may be related to the norms and values of the engineering profession, however the later than average timing of managerial transition undertaken by the women in this study suggests a

gendered aspect. Drawing on previous women in engineering studies, women may wait longer for than men to be invited to apply for management positions (Evetts, 1993), or may be discouraged by the onerous demands of managerial roles within engineering (Evetts, 1998; Servon & Visser, 2011). This may also be indicative of gender bias infiltrating personnel decisions, including promotion, task assignment, identification and selection of potential managers resulting in unequal access to advancement opportunities (Heilman, 2001; O'Neil & Hopkins, 2015).

7.3.3.3 Endings

The culmination of the transition to manager and leader is difficult to identify. The *Transition Continuum Model* represents both the ongoing course of transition, and the unresolved tensions that characterise the women's transition journeys. The findings of this research indicate that for women engineers, the transition to manager and leader does not conclude with the appointment to a management or leadership role, nor with a short adjustment period prior to reaching a state of stabilisation, a point of equilibrium (Ng et al., 2007; West, Nicholson, & Rees, 1987) or the developing of a managerial identity (Hill, 1992). Instead, a protracted period of adjustment with lingering tensions was observed, exacerbated for some by movement in and out of management roles. Most participants could successfully perform the tasks of their role, however the development of a managerial self-concept or identity was contested, as discussed in section 7.3.2.2.

For the women in this research, becoming a manager and leader is an ongoing process of becoming without a definitive conclusion point, aligning with the conclusion of Watson and Harris (1999) - "there is no clear point at which one becomes a manager" (p. vii). This standpoint considers that managers exist in a constant state of becoming and adaptation, influenced by dynamic relational and situational contexts that characterise management work (Andersson, 2010; Tengblad, 2002; Watson & Harris, 1999). For women, this extends to include ongoing negotiation of gendered tensions and identities.

This contrasts with some managerial transition research that suggests a “definitive state of managerial being” (Andersson, 2010, p. 167) exists, characterised by a clear set of learnable competencies (Katz, 1974, 1986; Mintzberg, 1973) needed to achieve a controlled and prescribed series of tasks (Tengblad, 2012); or the existence of a managerial ideal or a static self-concept (Watson, 2006).

7.4 The Strands of Transition

The three strands of the *Transition Continuum Model* represent the key influences that have shaped the women’s transitions. While an experience is personal and individual, this does not occur in isolation and nor by agency alone. Rather, it does so in relation to others and interacting with the structures of an organisation, the profession and the broader social climate. This section discusses the findings relating to the factors that affect the transition to manager and leader for women engineers. The key findings relating to the role that individual, relational and structural factors play in the women’s experiences are discussed.

7.4.1 Individual Influences

The role of individual level factors on the transition process has been recognised by researchers in careers and occupational psychology. The concepts of boundaryless (Arthur & Rousseau, 1996) and protean careers (Hall, 1996, 2004) that have dominated recent career literature emphasise the role of the individual in their careers. Factors such as motivational orientation (Nicholson, 1984), agentic factors (Forrier et al., 2009) and individual differences (Ng et al., 2007) have been noted to influence the outcome of a transition or to influence mobility within careers.

In this study, the bearing of individual level factors was evident from the early stages of the women’s transition and continued beyond appointment to their first managerial role. Self-awareness of their personal resources, predispositions and motivations, and a desire to pursue or accept roles that allowed expression of these shaped their transition. A focus on human capital, gaining competence and a desire to be assessed on merit was prevalent throughout the transition journey.

The individual factors that emerged as important to the women's transitions in the present study support previous works in part, but there are some interesting differences. The key individual factors that have shaped the women's transition experiences will now be discussed.

7.4.1.1 Personal Traits and Qualities

Instrumental characteristics and motivations, such as being self-driven, seeking career achievement, and desiring power and control, combine with relational qualities such as altruism, affiliation and interest in working with others, to influence the manager/leader transition. Empirical studies have related masculine or instrumental personality profiles to women's managerial advancement (Howard & Bray, 1988; Marongiu & Ekehammar, 1999; Metz, 2004; Tharenou, 2001) and values of 'power', 'achievement' and 'self-direction' to upward mobility (Ng et al., 2007). The design of this research does not enable confirmation of the predictive nature of certain traits and characteristics. However, this research suggests that a psychologically androgynous profile combining both masculine and feminine traits and motivations to be important to women engineers' advancement to manager and leader, which contrasts with these studies.

Moving beyond predictive traits, this research also suggests that the awareness of and reflection upon ones' predispositions and the desire to align and satisfy these aspects of the self both motivate and sustain the transition to manager. This aligns with current career mobility models that recognise the influence of self-awareness of career interests and values on the early stages of transition (Forrier et al., 2009; Ng et al., 2007).

The desire to align with and be authentic to the self was evident throughout the transition journey - acting as a driver to the broader and more onerous roles of management and guiding subsequent role choices and organisational moves. At the extreme, the decision by some women to return to and refocus their transition within the technical realm was driven by the desire for authenticity. Authenticity is a core tenant of the kaleidoscope career model developed by

Mainiero and Sullivan (2005). In contrast to this model, in which a desire for 'challenge' characterises early career, and authenticity becomes more relevant in later career, both authenticity and challenge appear to be important throughout the transitions explored in this research.

7.4.1.2 Managerial Ambition

Managerial aspiration - or the desire to become a manager – was not prevalent in this research. Instead, an alternative form of aspiration or general ambition to achieve in their careers and to fulfil their potential was displayed. Managerial aspiration has been described as necessary for women's managerial advancement, and the expression of aspiration to be more important for men than for women (Marongiu & Ekehammar, 1999; Tharenou et al., 1994). The contrasting findings may be associated with the historic tension between engineering and managerial roles within the profession, the high value placed on technical expertise (Mael et al., 2001) or the perceived challenges of managerial and leadership roles (Howard, 2003; Wilde, 2009).

Where aspirations for broader management and leadership roles did exist, they were rarely voiced and participants did not often put themselves forward for positions. Being "outspoken about career goals and desired assignments, and asking to be considered for promotion" (Sabattini & Dinolfo, 2010, p. 6) is deemed an unwritten rule of career development. Emphasising achievements and interests to senior organisational members (Kumra & Vinnicombe, 2008) and self-promotion (Klenke, 2011) are important to career advancement. In this study, general ambition and career aspiration were displayed but there was a sense of letting good engineering work do the talking, rather than active self-promotion.

7.4.1.3 Human Capital and Technical Competence

A focus on the accumulation of expertise, hard work and being assessed on merit endured through the participant's transitions. The emphasis on skill and knowledge building supports previous work on the impact of human capital on career advancement (O'Neil, Hopkins, and Bilimoria (2013) present an updated

review), career mobility (Forrier et al., 2009) and the positive influence of training and development on advancement to management, particularly in middle career and in moves to middle management (Tharenou, 2001).

An interesting point of difference from these studies is the focus on technical expertise, instead of knowledge specific to management and leadership. A strong technical base engenders confidence and provides a source of validation that is important in the women's readiness to pursue senior roles and their perceived ability to enact them. This resonates with the connection between self-efficacy and women's persistence in engineering work (Ayre et al., 2013; Buse et al., 2013; Singh et al., 2013).

Throughout the women's transitions, technical expertise is intrinsic to reputation, credibility and visibility. Strong technical expertise – or being a good engineer - establishes credibility with peers and others, and enhances visibility within the organisation. This influences opportunities for advancement and is a means for negotiating the challenges of a new role. Within the engineering profession, the role of technical expertise in conferring informal authority and facilitating the co-ordination of others (technical people) and their work is recognised (Trevelyan, 2007).

For women engineers, this is also a strategy for managing gender (Evetts, 1998). The continued reference to technical competence by established managers and leaders marries with Faulkner's finding that women engineers have to (re)establish their engineering credentials continuously through their careers in order to be taken seriously as engineers (Faulkner, 2009b). This study suggests that re-establishment or reminding of engineering competence is also requisite for perceiving oneself and being perceived by others as a competent manager and leader in engineering. A continued connection to technical expertise may be a means of identification with the dominant professional culture and a means of continuing to fit in (Faulkner, 2007).

7.4.2 Relational Influences

Women's transition to manager and leader within the engineering profession occurs within a dynamic relational matrix, that impacts work-based experiences, behaviours and decisions (Blustein, 2011; Kyriakidou & Ozbilgin, 2004). As highlighted earlier in this discussion, the dominance of interpersonal and relational elements seen in this research is not reflected in current work-role transition models in which individual and structural factors prevail. Further, within the context of the engineering profession, the role of relationships and relational factors on transition to senior roles is relatively unexplored.

Relationships with others have been recognised as important resources for new managers (Hill, 2003; Ibarra, 1999) and for women's career development and promotion opportunities (Kumra & Vinnicombe, 2008, 2010; O'Neil et al., 2013). In this section, key relationships and associated social capital that emerged as important to the women's transitions in the present study are discussed.

7.4.2.1 *Relationships and Opportunity*

Advancement opportunities were commonly facilitated by members of the women's professional networks acting as instigators, facilitators and gatekeepers. Many of the participants were approached to fill managerial positions, having been identified as an individual with potential. Others with power and influence within their organisations approached them with advancement opportunities, opened doors, and offered or suggested more senior positions.

The role of others in providing access to or hindering opportunity within organisations is recognised in the careers literature. Turner's (1960) sponsored-mobility perspective posits that early career employees identified as having high potential may receive attention and opportunities that increase their chance for advancement. Organisational members with career-shaping influence may act as proactive gatekeepers, responsive gatekeepers, and intermediary influencers (Bosley, Arnold, & Cohen, 2009) or sponsors (Ibarra et al., 2010). For women, the relative importance of the role of the sponsor, over the mentor, has been

recognised. Typically, women lack sponsors, and this combined with the existence of informal career development and promotion processes are linked to women's lower promotion rates (Kumra & Vinnicombe, 2008).

In this research, relationships with proactive gatekeepers, intermediaries and sponsors were prevalent and typically developed in the early stages of their careers. In contrast to recommendations from previous research, the women were not particularly proactive in seeking out and creating these relationships. Instead, there was a focus on cultivating and maintaining immediate work relationships, and leveraging off previous work relationships and the tendency to let solid engineering work speak for itself. As discussed previously, these patterns of individual and relational influences may be associated with manager/leader transitions occurring later in career.

Current work-role and career related transition concepts, including those specific to the engineering profession, do not recognise the role of relationships in providing opportunities for advancement. Forrier et al. (2009) include a social capital dimension in their 'movement capital' construct, but this is linked to the role that others play in an individual's awareness and perceived achievability of possible work-role transitions. Instead, current constructs link opportunities to advance into management roles to structural factors related primarily to the supply and demand within internal and external labour markets. This research suggests that relational factors play an important role in the creation of and access to advancement opportunities and must be considered in order to properly understand women's work-role transitions.

7.4.2.2 Supporting and Guiding Relationships

Relationships with others in and outside of the workplace provided guidance, support and inspiration throughout the women's transitions. This research indicates that women engineers moving into senior roles draw support from a broad range of relationships including mentors and sponsors, role models, direct superiors, team members, and formal and informal professional and personal networks. Key to the women's transitions was this broad range of relationships,

including with team members or subordinates, providing a form of socio-emotional support related to confirmation and reaffirmation of their credibility.

Previous studies have established that a new manager's network of relationships is a critical resource during their first year in a management role (Hill, 2003). New managers learn how to do the job and draw support by observing and interacting with superiors and peers. Observation of role models, reactions and feedback from others are key components of professional identity evolution in adapting to a new role (Ibarra, 1999).

The role of mentors, networks and networking in women's career advancement is well documented (O'Neil et al., 2013). Particular benefit is associated with career support from mentoring relationships (Burke et al., 2006; Metz, 2003; Tharenou, 2005) and sponsoring relationships that provide women with visibility, credibility, legitimacy and access to networks (Burt, 1998). Aligning with previous research, relationships with organisational influencers such as mentors, sponsors and role models were important. However, the absence of role models and possible mentors for women may prompt the formation of a broader range of supportive and guiding relationships.

Psychosocial support is associated with emotional wellbeing and acceptance and is directed internally (Kram, 1985). The role of psychosocial support in women's career advancement has primarily been examined in the context of mentoring relationships (Burke et al., 2006; Metz, 2003; Tharenou, 2005) and expressive networks including women's networks (Coleman, 2011; Ibarra, 1993). This research suggests alternative organisational relationships as sources of this form of support.

Within the mentoring context, psychosocial support is indicated as disadvantageous to women's career advancement (Tharenou, 2005). While this research does not focus on objective measures of career advancement such as salary, achieved managerial level or number of promotions, the importance of psychosocial support to the women's transitions to manager and leader appears to contrast with these studies.

A key difference is that the form of support relates to confirmation and reaffirmation of credibility. For women working in highly masculinised work environments in which women's credibility is continually questioned (Rickard & Crowther, 2015), the significance of support relating to credibility and validation is not surprising.

7.4.2.3 Relational Resources and Credibility Capital

The interactions between each woman undertaking the move to manager and leader and her social context were a source of relational resources - including credibility, reputation, visibility, validation and belonging - that shaped her experience of this transition. These resources generated a specific form of social capital termed 'credibility capital', that is important to women engineers' transitions to manager and leader.

Social capital theory is often used to explain the influence of resources emerging from interpersonal relationships on career, where social capital is the ability to access resources that provide benefit to an individual's career (Coleman, 1988). As discussed in the literature review in Chapter 3, social capital has been linked to career success and may influence women's entry to and progression within positions of management and leadership (Burke et al., 2006; Burt, 1998; Tharenou, 2001; Timberlake, 2005). 'Credibility capital' can be thought of as a particular form of social capital emerging from the credibility, reputation and visibility generated by a woman's human capital and social effectiveness (Zinko, Ferris, Humphrey, Meyer, & Aime, 2012). Like other forms of social capital explored in the context of women's career advancement, credibility capital may enable career success and access to organisational power.

There are some differences that offer a contribution to the understanding of social capital and women's career advancement. Firstly, as highlighted earlier, social capital has been mostly considered in relation to specific organisational relationships such as mentors and sponsors, in which the woman occupies a lower organisational hierarchical position. In contrast to this literature, 'credibility capital' appears to be generated through a broad range of

organisational relationships, including relationships with organisational subordinates. This suggests that in addition to emotional or psycho-social support discussed in the previous section, broader career communities have an instrumental function in women engineers' transitions.

Secondly, 'credibility capital' can be seen to influence a woman's sense of belonging, thus fulfilling psychosocial functions. Being perceived as credible by others and possessing a good professional reputation appear to be key to women's readiness to accept senior roles and to continue to advance. This finding adds to the emerging understanding of the role of self-efficacy in women's persistence in the engineering profession (Ayre et al., 2013; Buse et al., 2013; Singh et al., 2013). Self-efficacy has been recognised as important to women's continued engagement in engineering; credibility and reputation may act as determinants of self-efficacy, in a similar way to interpersonal cues such as feedback and persuasion (Gist and Mitchell 1992).

7.4.3 Structural Influences

The findings of this research indicate that the systemic norms of the engineering profession, and structures and policies of engineering-based organisations act as both providers of opportunity, and as constraints to women's advancement. The influence of structural factors is recognised in recent work-role transition concepts. Both Ng et al. (2007) and Forrier et al. (2009) propose that despite recent focus on the boundaryless career (Arthur & Rousseau, 1996) and on agency as a primary driver of voluntary job transitions, career-related moves are highly influenced by structural factors. The inclusion of societal, industry and organisational level factors that influence the availability of job vacancies, and the match between worker supply and demand, can provide insight into the reasons why people change roles (Ng et al., 2007).

The role of organisational support in the form of training and development opportunities, and the existence of diversity policies are suggested as important to women's advancement to management (Kottke & Agars, 2005; Metz & Tharenou, 2001). Within the engineering context, organisational support and

resources for managing successful managerial transitions may be limited to encouraging postgraduate study or the provision of management training courses (Seethamraju, 1997; Seethamraju, Agrawal, & Jayaraman, 1997). This research suggests that the influence of organisations and of the broader engineering profession on the participant's transitions extend beyond the offering of management training courses, or the availability of flexible work arrangements.

Aligning with recent work-role transition concepts, the organisation and the broader engineering profession can be seen to influence the availability of advancement opportunities. However, of greater prominence in this research is the influence of organisational structure and policies, and professional norms on the accessibility of these opportunities and to pathways of progression for women.

7.4.3.1 Pathways and Promotion Processes

Highly structured and defined organisational hierarchies, and roles with titles, explicit responsibilities and expectations had a positive influence on the participant's transitions. Visible pathways to manager and leader within an organisation facilitated progress, while a lack of transparency of promotion processes, or access to management pathways did not. As highlighted in the literature review, women's difficulty in accessing opportunity for promotion or navigating promotion processes has been associated with gender bias (Agars, 2004; Heilman, 2001; Heilman & Okimoto, 2007), differences in personal networks and difficulties in accessing informal networks (Ibarra, 1993; Kanter, 1977). Provision of clear and documented progression pathways have been recommended by multiple sources (Fitzsimmons & Callan, 2015; Hewlett, 2008). In this research, unclear promotion pathways or inexplicit access to advancement opportunities lead to reliance on relationships with influential others to open doors (see section 7.4.2.1), reinforcing previous research that has emphasised the role of others as facilitators or hinderers to women's advancement opportunities (Bosley et al., 2009; Kumra & Vinnicombe, 2008, 2010).

Organisational policies regarding part-time work acted to both facilitate and constrain the women's transitions. Part-time work was available in all organisations, supported by organisational policy and used by most women with children for a period of time to accommodate child-rearing responsibilities; part-time management roles were not universal but surprisingly common. Part-time management roles enabled women to continue as managers, but this was not without challenge. Part-time management roles have been associated with stalled career progress and a lack of promotion opportunities, which may be exacerbated by a lack of mentors or positive female role models (Durbin & Tomlinson, 2014). This resonates with the experiences of some women in this research who experienced plateaued progress, and judgement of their commitment and capability as part-time workers, even in management positions. Interestingly, those working in highly structured organisations such as the military perceived that they were able to continue their careers as part-time managers without penalty. It is unclear whether this was due to influential relationships or the effect of organisational structures.

Rigid policy against part-time management roles convoluted the women's management and leadership transitions. Organisations that would not consider part-time management roles forced women managers to revert to technical roles on returning from maternity leave. Such policy impacted the women's transition in various and contradictory ways. As discussed earlier, such policy excludes women from the manager group and reinforces the perception of women as mothers as non-ideal or secondary employees (Kmec, 2011; Lewis, 2001). In contrast to this perception, and aligning with Kmec (2011), women in this research who had parenting responsibilities were highly motivated and effective workers. Oscillating between managerial and technical roles was often cast in a positive light and motivated some women to catalyse their transition and pursue further managerial positions. The contrast with the negative implications of reduced power, reward and status associated with moves away from management (Ng et al., 2007) may be associated with the apparent continuum between engineering and management roles in the engineering profession in comparison with other professions and the reliance on engineering acumen as a

means of maintaining credibility normally associated with senior roles. The impact of women temporarily leaving a management and leadership role has not been well considered in the transition literature and offers an area for future investigation.

7.4.3.2 Project Based Work

Engineering work is frequently project based, characterised by dynamic but temporary systems, structures, teams and roles (Mills & Treagust, 2003). In this research, participants working on projects fulfilled management and leadership roles for a finite duration. Instead of a series of connected and continuous roles of increasing responsibility and scope, the project based nature of engineering work created transition pathways in which management positions were interspersed with technical or engineering-related roles. While this movement is not associated with the challenging perceptions of part-time work and the non-ideal worker discussed above, and may be experienced by both men and women in the engineering profession, research suggests that this transition pattern may be more difficult for women.

Project based roles are associated with new tasks, schedules, clear objectives and specifically selected teams. Project work is characterised by “continuous negotiations concerning tasks, responsibilities and boundaries” (Lindgren & Packendorff, 2006, p. 842) and temporary teams invite repeated renegotiation of workplace relationships. Interpersonal research suggests that membership negotiation, establishing trust and acceptance within the workplace is more challenging for women (Myers, 2010). Women engineers working in project work in both technical and managerial capacities are forced to re-establish their credibility with new teams, role after role. This informs the emphasis placed by women on competence, particularly their engineering and technical competence, as it is repeatedly called into question through their careers. Creating and maintaining work relationships, and utilising pre-existing relationships as a transition resource may serve as an antidote.

7.5 Conceptualising Management and Leadership in Technical Organisations

In this final section of the discussion, the focus shifts to examining women's conceptualisation of management and leadership, and of manager and leader, in technical organisations. In the review of the literature on management and leadership in the engineering profession, it was concluded that women engineers' perspectives are largely absent from the current understanding of management and leadership in the profession and that a key contribution of this research would be to introduce these perspectives. Accordingly, this section considers the management and leadership roles and responsibilities assumed by women managers and leaders in engineering. This is followed by a discussion of women engineers' perceptions of management and leadership as integral to engineering work, functional rather than hierarchical, and as relational rather than transactional.

7.5.1 What Does a Manager and Leader Do?

Women managers and leaders in engineering occupied multi-faceted and complex roles, comprising relational, organising and technical responsibilities. Particular emphasis was given to relational aspects of the role, including responsibility for others, relationships with others and communication, and the continued connection to technical work.

The complexity of managerial work is not specific to the engineering profession, echoing the brevity, highly fragmented and interrupted nature of management activities identified by other scholars (Hill, 2003; Mintzberg, 1973, 2009). The nature of managerial work has been extensively studied by Mintzberg (1973, 2009). The answer to the question 'what do managers and leaders in engineering do?' support aspects of Mintzberg's conceptualisation of managerial work.

Its relational nature is recognised in his series of 'Manager's Working Roles' as interpersonal roles of Figurehead, Leader and Liaison, while his more recent model of managing captures relational work through the acts of 'Leading' teams, 'Linking' with the rest of the organization and the outside world. Internal relational work such as delivering capability through and from within teams

through managing others, developing and coaching individuals within their teams, and building and maintaining these teams described by the participants align with 'Leading'. The emphasis on collaboration and liaison within and external to the organisation corresponds with "the web of relationships that managers maintain with numerous individuals and groups outside their units" (Mintzberg 2009, p. 73) assigned to the act of 'Linking'. A point of difference in this research is the framing of communication as a relational activity, rather than the transactional function described by Mintzberg.

The emphasis on relational aspects of the manager/leader role may be considered surprising in the context of the engineering profession where the image of 'real work' is related to hands on work, problem solving and technical talk (Fletcher, 2001; McIlwee & Robinson, 1992), and engineers are perceived as unsuitable for these roles due to lack of requisite skills and incongruent orientations and motivations (Morrison, 1986; Roberts & Biddle, 1994). This research supports recent engineering practice research to challenge these perceptions and further highlight the disparity between the image and reality of engineering work. A large proportion of work performed by engineers from the early stages of career is coordinating work – a highly relational and informal process (Trevelyan, 2007). Communication, interfacing and decision making are desired competencies for effective engineering managers and leaders (Goh, Coaker, & Bullen, 2008).

Moving beyond relational tasks and responsibilities, this research reveals an approach to management and leadership work or ways of working as managers and leaders that are steeped in relationality. Relationality in the context of women engineer's work behaviour has been the focus of work by Joyce Fletcher. Fletcher (2001) revealed a way of working in the engineering workplace termed *relational practice* – comprising intentional and strategic behaviours founded in mutuality and connection, and requiring "relational skills such as empathy, mutuality, reciprocity and sensitivity to emotional contexts" (p. 84). The findings of this research align with Fletcher's findings and extend her observations of women engineers engaging in relational practice, to women managers and

leaders within the engineering context employing relational practice to deliver a capability.

Fletcher noted that relational practice is “rooted in a stereotypically feminine value system” (ibid p. 4) which she explains is in direct contrast to the dominant definitions of success and competence in organizations. This dissonance results in relational work behaviours being devalued and ultimately disappeared. The design of this study did not allow me to ascertain whether relational work during the performance of their manager/leader roles was ‘disappeared’, but the findings indicate that both the women’s perception of nature of their roles and the way in which they affect them are highly relational.

The findings of this research highlight technical work as a dimension of management and leadership roles. This was evidenced by continued performance of technical work, provision of technical expertise and application of technical knowledge to business development, sales and team development by participants. These findings contrast with the separation of engineering and management and the clear delineation between engineering and management roles discussed in the literature review. Instead, this research indicates a blending of responsibilities and a continued connection to technical work by managers and leaders in engineering, aligning with recent engineering practice research (Seethamraju, 2004; Trevelyan, 2007, 2010; Williams & Figueiredo, 2011, 2012).

The prevalence of technical work within the managerial role in engineering also contrasts with some models of managing. Discussing his recent book ‘Managing’, Mintzberg stated:

“One of my favourite conundrums is how do you stay connected when the very fact of being a manager disconnects you from what you are managing? In other words, yesterday you were an engineer, today you are managing engineers, so you are no longer doing engineering, so how do you face that?”

(Thinkers50, 2011, pp. question 5, para. 3)

While managers do sometimes engage in the regular operating work of their organisation this is presented as an irregular occurrence - in the case of substituting for a team member or choosing to engage in this work occasionally for enjoyment or to keep touch (Mintzberg, 2009). In contrast, the findings of this research indicate that the technical dimension of the manager role in engineering is much more integral.

The reasons for the continued connection to technical work by the managers and leaders in this research are structural (that is: a norm of the profession), relational and gendered. On the critical role of technical expertise in engineering co-ordination, Trevelyan (2007) notes that “coordinating people, and gaining their willing cooperation, is the most prominent aspect of engineering practice and this relies on technical knowledge and expertise as much as interpersonal skills” (p. 196). Further, technical expertise is significant in establishing informal authority and an ability to influence.

An interesting contradiction in the findings was revealed when speaking of other, mostly male managers and leaders, highlighting the gendered nature of this technical connection. When describing the work done by other managers and leaders, there was a focus on commercial, interpersonal and technical acumen. There was far less focus on the technical aspects of other manager’s roles and mixed views on the requirement of technical acumen to be an effective manager or leader. Rather there was priority placed on commercial and interpersonal acumen. For women, whose authority and influence is continually questioned, a continued connection to technical knowledge may be a means of identification with the dominant professional culture and a means of continuing to fit in (Faulkner, 2007). Continued technical work may indeed facilitate their ability to co-ordinate others (technical people) and their work through the generation of respect and credibility.

7.5.2 Management and Leadership Orientations

Management and leadership were considered as integral to, rather than distinct from, engineering by women engineers. This is evidenced by the continuous

nature of women engineers' transitions to manager and leader, their convoluted and varied transition pathways, and fluid and coexisting professional identities.

Management and leadership work was performed throughout the engineering career, often from early career, and was viewed as part of the engineering role. This contrasts with engineering management literature that considers management as distinct from engineering (Badawy, 1995; Johnson & Sargeant, 1998; Rynes, 1987) but support the conceptualisation of engineering as a hybrid technical-managerial profession (Seethamraju, 2004; Trevelyan, 2007, 2010). The concept of manager and leader expressed in this study aligns with that of the Player-Manager (Augur & Palmer, 2002). In contrast to other routes to management, the Player-Manager does not move from individual contributor to manager, rather combines the roles of producing and managing. Hill (2003) also acknowledges blurring between individual contributor and first-line manager.

Management and leadership were considered as different but interrelated functions, often performed together. The concepts of 'manager' and 'leader', and 'management' and 'leadership' are frequently differentiated in the literature. Mintzberg (2009) declares that "instead of distinguishing managers from leaders, we should be seeing managers as leaders, and leadership as management practiced well" (p. 9). This research supports an alternate view in which managing and leading are entwined and inclusive (Buchen, 2005).

As a result of the integrated perspective adopted by participants, management and leadership were defined as functional rather than hierarchical attributes. Women engineers did not relate their definitions of management and leadership to a certain level within an organisational hierarchy. This was particularly the case for leadership. Structural constraints and personal preferences resulted in the construction of leadership concepts beyond formal organisational roles, that were commonly related to technical leadership and ability to influence. These constructions reflect contemporary understandings of leaders and leadership that have evolved from that of individual authority, to an interdependent and collaborative property of a group of people (Day & Harrison, 2007). Further, leadership may be defined as relational quality that is "earned, not anointed"

(Mintzberg, 2009, p. 9) and thus leaders are not required to occupy positions of formal authority to exercise leadership (Day, 2000).

Leadership beyond formal organisational roles aligns with engineering leadership orientations identified by Rottmann, Sacks, and Reeve (2015). In particular, leadership perceived as ‘technical mastery’ (p. 358), combining technical expertise and mentorship, or ‘collaborative optimisation’ (p. 360), with its emphasis on process optimisation and team catalysis, resonate with the conceptualisation of management and leadership of several participants. The findings reinforce that accepted alternative management and leadership orientations are available in the profession.

Finally, women engineers have a relational orientation to management and leadership. Being a manager and leader extends beyond appearing as a figurehead or individual authority associated with traditional concepts of management and leadership. Instead, management and leadership are viewed as collaborative functions, adopting roles of mentor, coach, advocate, carer and apprentice and using a relational approach. This approach reflects aspects of relational leadership (Uhl-Bien, 2006), with emphasis on communication, mutuality and shared authority (Gittell, Douglass, Ancona, Backman, & Parrot, 2011). While women manager and leaders in engineering do conceptualise management and leadership in a relational way, the relational leadership concept does not capture the conditional and disparate power relations within their organisational relationships, aligning with Fletcher’s (2004) argument regarding the gender and power dynamics inherent in this construct.

7.6 Chapter Summary

This chapter has drawn together key findings of the research presented in Chapters 5 and 6. The key findings were discussed in relation to existing literature, highlighting points of intersection and contrast.

The initial three sections of the chapter focused on the first and third research objectives which relate to women’s transition experiences and influencing factors. A conceptual model, the *Transition Continuum Model*, was developed

from the key findings. This model articulates women engineers' experiences of transition to manager and leader and provided a framework for the discussion of the research findings in relation to existing knowledge. The *Transition Continuum Model* illustrates the complexity and ongoing nature of women engineers' transition experiences. The model posits that women engineers experienced the transition to manager and leader across three dimensions: an external journey encompassing multiple organisational roles, an internal journey of encountering and negotiating the changes and challenges associated with new organisational roles, unfolding over time. The dimensions of the transition experience were shaped by a triad of interplaying individual, relational and structural influences. These influences act as both facilitators and impediments to women's transitions.

The final section of the chapter examined women engineers' perceptions of management and leadership, and of manager and leader, in technical organisations, providing a standpoint lacking in the current understanding of management and leadership in the engineering profession. Women managers and leaders in engineering described multi-faceted and complex roles, comprising relational, organising and technical responsibilities. They conceptualised management and leadership as integral to engineering, as functional rather than hierarchical, and held a relational orientation.

Several points of difference from the current understanding highlighted in this chapter indicate the contributions of this study to theory and practice. These are the focus of the final chapter of the thesis. The thesis concludes in Chapter 8. The contribution of the research to knowledge is summarised. The limitations of the study are discussed, and the implications for individual and organisational practice are considered. Finally, potential avenues for future research arising from this study are shared.

8 Conclusion

8.1 Introduction

This chapter concludes the thesis by reviewing the aims of this study and the significant findings regarding women engineers' experiences of transitioning to manager and leader. The focus of the research was to extend the understanding of women engineers' experiences of advancement to positions of influence within technical organisations, specifically those of manager and leader.

Chapter 2 established the context for this study. The rise of women's workforce participation and increased access to organisational management and leadership positions, and traditionally male occupations and industries was considered. Characteristics of the engineering profession in Australia were examined, providing the professional context relevant to women in the study. Women's participation in the Australian engineering workforce and key issues relating to their advancement were reviewed.

Chapter 3 reviewed academic literature relevant to women engineers' experiences of career advancement. This chapter located the research topic at the intersection of three areas of knowledge: that specific to women in the engineering profession, a broader area of literature concerning women's advancement to management, and that relating to management and leadership within the engineering profession. Synthesis of this literature revealed that little is known about women engineers' progression to management and leadership roles and an understanding of the point of intersection of gender, engineering and management and leadership is not afforded by existing research.

Chapter 4 detailed the development and implementation of the research approach. The research question and aims were specified and the enquiry framework, formed by the interplay between the research question and objectives, theoretical perspectives, philosophical assumptions and the researcher's worldview, was established. To achieve the research aims, a

qualitative approach, informed by phenomenological and feminist perspectives was adopted.

The findings from twenty-two interviews with women engineers were presented in Chapters 5 and 6. Chapter 5 considered the managerial and leadership roles occupied by the study participants. This provided an understanding of the organisational roles and responsibilities assumed by the participants, and the perceived skills, behaviours and qualities required to fulfil these roles. Chapter 6 focused on the experience of transition to manager and leader for women engineers.

The findings presented in Chapters 5 and 6 were discussed in relation to current academic knowledge in Chapter 7. The discussion of the findings was guided by the conceptual model emergent from the findings termed the *Transition Continuum Model*. This conceptual model explains the multi-dimensional nature of women engineer's experiences of transition to management and leadership, shaped by the interplay of individual, relational and structural factors. Chapter 7 also discussed women engineer's perceptions of management and leadership in the engineering profession. Women managers and leaders in engineering conceptualise management and leadership as integral to engineering work. They hold a relational orientation to management and leadership, placing great value of relationships with others and delivering organisational capability through collaborative roles.

In this final chapter, research findings that are distinguished from previous research and the contribution made by this thesis to current understanding of career transitions are summarised. The implications of the research findings to organisational and individual practice are considered. A critique of the study methodology and procedures is offered, identifying limitations of this research design. The chapter closes by proposing avenues for future research.

8.2 Research Focus and Key Findings

This study set out to explore the experiences of women engineers who had become managers and leaders within technical organisations in Australia.

Having established that limited scholarly attention had been paid to women engineers' career advancement and their experiences in senior roles, and the indication that these experiences were likely to differ from those forming current understanding, the study adopted an exploratory approach. This was guided by a central research question which asked: 'How do women engineers transition to managers and leaders in technical organisations?' In particular, the study sought to understand these experiences of transition from the perspective of women engineers and to uncover the shaping influences. The study was also interested in exploring women engineer's perspectives of management and leadership roles and their orientations towards management and leadership.

To answer the research question and fulfil the study objectives, a qualitative approach combining phenomenological (Moustakas, 1994; Rehorick & Bentz, 2008; Van Manen, 1990), and feminist (Calás & Smircich, 2009; Harding, 1987a, 1987b, 1991; Oakley, 1981) perspectives was adopted. This approach focused the research on the phenomenon of becoming a manager and leader in the engineering profession and through an iterative process of reflection and interpretation sought to make sense of women's diverse experiences of this phenomenon. It recognised the gendered nature of women's experiences within organisations, and the absence of their perspectives from the current understanding of advancement to manager and leader within the engineering profession. The study sought to make visible these perspectives, thus extending and broadening the current understanding of management and leadership in engineering. My own background and situated knowledge as an engineer who had experienced the phenomenon being explored was also called to attention.

The key findings of this research are summarised below, and provide a foundation for the study's contribution to knowledge and implications for practice detailed later in this chapter.

Women engineers' experience of transition to manager and leader:

- Women engineers' transition to manager and leader was an ongoing process represented by the *Transition Continuum Model*. This conceptual model

depicts their transitions as occurring over three dimensions: an external manifestation accompanied by an internal journey, unfolding over time, shaped by an interplaying triad of individual, relational and structural influences.

- Women engineers' transition to manager and leader occurs over a series of phases: 'Getting Started', 'Making a Move', 'Encountering Challenge and Change', 'Negotiating the Environment' and 'Resolving and Redefining'. These phases do not have a fixed duration and may occur concurrently, emphasising the fluid, temporal nature of transition.
- The transition commences well before appointment to the first managerial and leadership role. Early career experiences and interactions provide a foundation for the transition and must be considered to understand their transition.
- The transition pathway can be multi-stepped and multi-directional, encompassing a series of organisational roles including reversion to technical roles, periods of stagnation or slower organisational advancement.
- A managerial/leadership and technical role oscillation was observed. This was primarily driven by organisational and profession specific structural influences. This transition pattern had a paradoxical effect - acting to deviate women away from a traditional linear advancement path, while also providing a strategy for managing gender within organisations.
- The transition to manager and leader is a conflicted experience, characterised by change and challenge. In addition to tensions arising from new organisational responsibilities, women engineers also encountered challenges relating to the gendered environment of engineering organisations which remained unresolved engendering coping techniques.
- Becoming a manager and leader is experienced as an ongoing process without a definitive conclusion point. It is characterised by ongoing negotiation of gendered tensions and identities.
- Women engineers did not always develop a manager or leader identification, despite occupying managerial and leadership roles for many years. The engineer identity was a strong professional identity that persisted, and sometimes coexisted with other professional identities.

Factors influencing women engineers' transitions to manager and leader:

- The transition experience was shaped by the interplay of a triad of influences: individual factors, relational factors and structural factors. The degree of influence of these factors fluctuated as women's transitions progressed.
- A focus on human capital, gaining competence and a desire to be assessed on merit was prevalent throughout the transition journey.
- At the individual level, self-awareness of personal resources, predispositions and motivations, and a desire to pursue or accept roles that allowed expression of these shaped the transition.
- At the relational level, relationships with others were key to accessing opportunity, and accessing support and guidance. A highly relational approach was utilised to navigate their transition through a broad range of relationships, including with team members or subordinates.
- Key to their transition was a form of socio-emotional support related to confirmation and reaffirmation of their credibility, accessed from this broad range of relationships.
- 'Credibility capital', a form of social capital emerged as important to women engineers' transitions. It relates to the credibility, reputation and visibility resulting from a woman's human capital and social effectiveness. 'Credibility capital' has both instrumental and psychosocial mechanisms: enabling career success and access to organisational power, while also fulfilling psychosocial functions such as belonging and readiness to advance.
- At the structural level, the organisation and the broader engineering profession facilitated or constrained the pathways of progression, through organisational structure and policies, and professional norms.

Conceptualisation of management and leadership in engineering:

- Management and leadership within the engineering profession delivers a capability.
- Management and leadership roles are multi-faceted and complex, comprising organisational, technical and relational dimensions.

- Management and leadership were commonly associated, but leadership was also conceptualised beyond formal organisational roles and was linked to technical expertise or technical leadership.
- Women engineers' conceptions centred around the integral nature of engineering, management and leadership, and their relational orientation towards management and leadership.
- They viewed management and leadership as collaborative functions, performed through roles of mentor, coach, advocate, carer and apprentice and using a relational approach.

8.3 Contribution to Knowledge

Women engineer's advancement to positions of influences within technical organisations is a complex and ongoing process. The *Transition Continuum Model* demonstrates that to understand women engineers' transition to manager and leader, the multiple dimensions of and influences on their experiences must be considered together as dynamic system.

The outcomes of this research are believed to contribute to existing academic knowledge in four key areas. Firstly, to increase the understanding of women in engineering careers through the identification of the concept of credibility capital. Secondly, by providing an explanation as detailed in the *Transition Continuum Model* of the processes relating to women's advancement to management and leadership in the engineering profession. Thirdly, the concept of manager/leader – technical expert oscillation is introduced. Oscillation provides a means for different professional identities to coexist. Finally, the research contributes to the broader field of work-role transition by highlighting the dynamic nature of transitions particularly in relation to women's careers in engineering.

8.3.1 Women in Engineering

This study is one of few to explore the advancement of women engineers, specifically to positions of organisational management and leadership. To date,

studies have centred on the attraction, education and retention of women into the engineering profession and the associated barriers, challenges and issues (for example: McIlwee & Robinson, 1992, Gill et al., 2005, Mills et al., 2008). Focusing on the success of women engineers, rather than the barriers to their progress, has revealed the multiple, interplaying influences that act both to facilitate and constrain their progression within organisations. This research reaffirms that many constraints do exist, but also reveals a range of strategies and techniques employed by successful women engineers to negotiate them.

This research adds to the emerging body of work on women's persistence in engineering careers (Ayre et al., 2013, 2014; Buse & Bilimoria, 2014; Buse et al., 2013; Singh & Fouad, 2011; Singh et al., 2013). In particular, this study has established the importance of relational factors to women's continued employment and career progression in the engineering profession, building on the individual and agentic focus of previous studies. It recognises the well documented role of relationships with organisational influencers in more senior hierarchical levels, but also reveals that a broad range of relationships, including with subordinates, as important to commencing and continuing the transition to manager and leader.

This research emphasises the influence of relational resources of credibility, reputation and visibility. It identifies a new concept of 'credibility capital' as central to women engineers' advancement, enabling access to advancement opportunities and organisational power, and fulfilling psychosocial functions important to their sense of belonging and readiness for career advancement.

This research also reaffirms the relevance of professional identity for women engineers, with the 'engineer' identity persisting through to senior organisational roles. The coexistence of an engineering identity with a range of other professional identities, often through a process of oscillation, reveal how women engineers in management and leadership roles construct their professional identities.

8.3.2 Women's Advancement to Management and Leadership

The research adds the perspective of women who have experienced professional success within a specific, highly gendered profession to the current understanding women's advancement to management and leadership.

The findings have highlighted the role of professional contexts on women's advancement. They reveal that specific characteristics and norms of engineering profession and engineering organisations act to shape women's transitions. These include organisational policy concerning commencement of management and leadership roles, and the availability of part-time management work. This study has also highlighted norms governing accepted career paths, the hybrid technical-managerial conceptualisation of engineering and the project-based nature of much of engineering work, thus reinforcing calls for context specific research within the field of women's career advancement (Alvesson & Due Billing, 2009; Johns, 2001; O'Neil & Bilimoria, 2005).

While the research design does not support generalisation of the research outcomes, the conceptual model developed to explain women engineers' transitions has the potential to be applied to managerial / leadership and broader role transitions in other professions. With its focus on women's experiences, this study extends the understanding of women's advancement to management and leadership beyond isolatable determinants and predictive factors. This research suggests that women's' transitions to manager and leader should be considered as an ongoing, involved process. Through this lens, the research has highlighted the influence of early career experiences and interactions on subsequent career success. It has also established the variety of pathways followed by women to positions of influence. This includes but is not limited to those with family responsibilities. Finally, the continued negotiation of gendered tensions even in senior organisational roles has been established.

8.3.3 Management and Leadership in the Engineering Profession

Women have been largely absent from the literature related to engineering management and leadership. A key contribution of this research has been to

introduce their perspectives. Differences between the conceptual *Transition Continuum Model* that explains women's experiences of advancement to management and leadership roles within the engineering profession, and previous work (Howard, 2003; Seethamraju, 1997; Wilde, 2009) validate differences in women engineer's perceptions and experiences.

In addition to those contributions to the women in engineering literature highlighted in section 8.3.1, this research identifies the dominant role of relational factors on advancement to management and leadership not previously considered within the engineering context.

With regards to the challenges experienced by engineers becoming managers and leaders, this study has revealed that women engineers experience additional gendered challenges during their transition, not captured by previous studies (Howard, 2003; Wilde, 2009). These include continual questioning and reestablishment of professional credibility, difficulties in juggling demands of managerial and leadership work and out of work responsibilities, and uncertain and contested understanding of the mechanisms of their progression.

This study also provides women's conceptualisations of management and leadership not previously available. Women engineers views of management and leadership work as integral to engineering, both functional and relational adds to the limited discourse on management and leadership orientations within the engineering context (Reeve et al., 2015; Rottmann, Sacks, & Reeve, 2015; Rottmann, Sacks, Simpson, et al., 2015).

8.3.4 Work-role Transitions

More broadly, this research contributes to the field of work-role transition or career mobility within careers scholarship. This formed part of the discussion of the findings in section 7.2.1; a summary is offered below.

The *Transition Continuum Model* shows that for women engineers, role transitions are an extended process, complicated by convoluted career pathways.

This model suggests that the scholarly understanding of role-transition could be enhanced by:

- Considering transition as an ongoing process extending before and beyond appointment to a managerial or leadership role.
- Encompassing early career experiences as part of a role transition.
- Acknowledging that transition may occur over multiple organisational roles.
- Understanding that culmination of a transition is difficult to define.
- Understanding that the external demonstration and internal experiences inform each other, but may not be aligned.
- Recognising the interplay of influences that both facilitate and constrain role transition. In particular, consideration of relational factors beyond those commonly examined through the lens of social capital, and the role of context-specific structural influences.

8.4 Implications for Practice

The findings of this research have numerous and significant implications for advancing women in engineering and other male-dominated professions. These implications consider employing organisations, managers of engineers, and women engineers advancing or wishing to advance into management and leadership roles.

8.4.1 For Organisations

The research findings highlight the important role that employing organisations play in both facilitating and constraining the advancement of women engineers, particularly with regards to their access to progression pathways and continued advancement.

Organisations are encouraged to apply a gender lens to their current organisational pathways to management and leadership. This involves becoming aware of patterns of difference between men and women's employment within the organisation and the reasons for these, and considering the ways in which current organisational policy may affect men and women's careers differently.

Applying a gender lens is linked to uncovering unconscious bias (Fine, 2010) and is key to embedding an organisational culture that supports diversity and to moving beyond a 'tick a box' approach to addressing gender in organisations.

Applying a gender lens may include examining the positions or tasks that male and female employees are offered and occupy, considering the current management and leadership pipeline to understand membership and mechanisms of accessibility, and examining organisational practices that channel women into positions with lesser organisational value. Linked to this is assessing gender pay gap, inclusive of bonuses and allowances, within the organisation.

This research has conceptualised becoming a manager and leader as an ongoing and convoluted process, commencing in early career and continuing through into later career. The implication of this for organisations is the provision of targeted support for women engineers along the transition journey. The contextual review in Chapter 2 revealed that there is little specific support for women engineers in management and leadership. Beyond the engineering context, support for women managers and leader tends to occur after appointment to these organisational roles. The importance of early career experiences and interactions highlighted by this research suggests that intervention and support from early career is required. This may involve establishing a pipeline of women from junior organisational levels and ensuring that they receive relevant experiences, opportunities and connections.

Targeted support should include professional development for both women engineers and their managers and supervisors. This research suggests that individuals should be informed about the concept of role transition, and the dimensions and elements that influence managerial and leadership transition. Supervisors should be educated about the important role that they play in women engineers' career advancement; women engineers should be encouraged to be proactive in their career planning and development.

The return to the workforce following maternity leave has been highlighted as a crucial period in women's transition journeys. While this research revealed that

most women engineers had access to part-time work, organisations should ensure that quality work including management and leadership responsibilities are made available. Organisations are urged to consider job design that allows maintenance of management and leadership career paths. The duration of women's utilisation of part-time work is a fraction of a working life. Organisational constraints at this juncture have a long-term career cost for women.

For many reasons highlighted in this research, the pathway to manager and leader is less clear for women. Structured and visible processes are beneficial. Thus, organisations are urged to document the promotion pathways and processes currently in use within their organisations. Further, organisations are encouraged to reconsider traditional conceptions of management and leadership and conventional linear pathways of advancement that may exist. The women in this study have revealed that there are many pathways to manager and leader and organisations have an opportunity to identify and articulate this range of alternative pathways. This enables the holding up of those taking different paths as role models for young engineers.

A final possibility for organisations is to understand the perspectives and values held by their employees and to incorporate these into organisational practice. Further, as identified by Rottmann, Sacks, and Reeve (2015) and supported by this research, engineers hold different orientations to management and leadership that may not align with popular models. This is a step towards challenging masculine conceptions of success that in reality may suit a minority of employees within the profession (Alvesson & Due Billing, 2009; Faulkner, 2009a; Johns, 2001; O'Neil & Bilimoria, 2005).

8.4.2 For Managers of Engineers

Managers and supervisors play a vital role in the advancement of women engineers. This research has shown that they act as gatekeepers and purveyors of opportunity but are also key in the development of women's sense of belonging, identity and readiness to advance in their careers. Managers should

become aware of the influence that they have on women engineers' career advancement, by virtue of their organisational role.

Managers of women engineers are encouraged to enact the suggestions made for organisations. Accounts from women in this study revealed that while an organisation may take a position or develop policy, its implementation is often at the discretion of those at the manager or supervisor level.

Gaining an understanding of organisational role transition would be beneficial for managers. The findings of this study imply that to support an employee's transition journey, the various dimensions of experience and the influences that shape organisational role transition should be understood. That is: for women, progression to management and leadership may take a variety of forms, encompass a range of phases that are not time dependent, and is accompanied by an extended period of adjustment and identification.

A further implication for managers is the consideration of the unique and diverse experiences of each individual team member. Managers can help guide women engineers' career advancement by having regular discussions about maintaining career progression and by remaining cognizant of the demands of out of work responsibilities. Further, managers should avoid making assumptions about the availability or willingness of women engineers with regards to challenging assignments. This is particularly so for part-time employees. As women in this research have indicated, situations can and will be adjusted for an important role.

8.4.3 For Women

Women working in the engineering profession can use the research findings to support their career advancement. Implications for women include understanding concept of work-role transition, and the dimensions and influences that shape role changes. Women are encouraged to adopt a proactive approach to career advancement, but also to recognise that they cannot act by agency alone and to acknowledge and understand the role that their organisation and others have in facilitating and constraining their career advancement.

Women are encouraged to consider their career advancement as a multi-dimensional and complex system. As with managers of engineers, gaining an understanding of role transition and becoming aware of the various aspects and influences that shape the experience of becoming a manager and leader is suggested. Previous studies emphasise the reliance of high achieving women on their own agency (Coleman, 2011; Metz, 2003). An implication of this study for women engineers is to understand that while agency is important, career advancement does not occur in isolation. Of importance is understanding the constraints to career advancement that may occur, and their associated adaptive coping strategies that may be beneficial in particular contexts.

Women are encouraged to adopt a proactive approach to advancement from early career, particularly with regards to the signalling of career ambitions and interest in organisational advancement. This may involve becoming clear on what personal career aspirations are, and developing a mid to long term view of what they wish to achieve. Maintaining communication and signalling intent is particularly important for women with caring responsibilities utilising part-time work

Women are encouraged to form and foster a broad range of organisational relationships. Supporting previous research on high-potential networks (Ibarra, 1993), this research has revealed that diverse networks are an important source of opportunity and support throughout career. Further, women should understand the concepts of credibility and reputation within engineering careers and understand how they shape the perceptions of others and influence access to opportunities.

Given the influence of organisational practices on women's career advancement indicated in this study, women are recommended to become aware of the promotion processes and practices in place within their employing organisation. Concurring with Fitzsimmons and Callan (2015), some organisations support women than better than others. If the current organisation does not provide thriving conditions, seek employment elsewhere.

A final implication for women is to recognise the internal dimensions of transition and advancement. This research has highlighted that transition is a conflicted experience and that adjustment can be prolonged. Many women harbour high levels of stress and conflict as they advance in their careers. Establishing an outlet for this and seeking support from those with similar experiences is highly recommended.

8.5 Research Limitations

While achieving the objectives of the study and providing a deeper understanding of women engineers' experiences of transition to senior organisational roles, decisions made during the research process placed some limitations on research outcomes. In addition to the reflections already offered in Chapter 4, this section explores the limitations associated with sampling and data collection techniques.

As guided by the research question, the study considered a limited context focused on women engineers working within the Australian technical organisations. The applicability of the results to women engineers within the international context or to women working in professions other than engineering is not established. This limitation provides an avenue for future research.

Further, data was collected from women engineers working in Australian organisations employing over 100 people. The reasons for this decision were made clear in Chapter 4, however, it precluded insights from women working in small organisations. Given the impact of organisational factors on women's transition experiences, this limitation may be addressed in a further study.

Data collection through interview elicited retrospective data. Issues associated with the accuracy of information provided by participants, particularly with regards to recall of events that occurs many years prior, have been raised (Hycner, 1985; Oakley, 2016). Supplementary data collection methods capturing the transition experience in real time may offer opportunity to generate further rich data and alleviate concerns regarding use of retrospective data.

A final limitation concerns the use of criterion and snowball sourcing of participants. The research findings have highlighted the heterogeneity of engineering specialties and roles, and of organisations and industry sectors employing engineers. Criterion and snowball sampling have inadvertently elucidated these variations but may not have produced as diverse a participant group as other sampling methods.

8.6 Further Research

The outcomes of this research and acknowledged limitations offer several directions for further research.

A key contribution of this research was the development of the *Transition Continuum Model* - a conceptual model illustrating women engineers' managerial and leadership transition experiences across three dimensions, and shaped by individual, relational and structural factors. This model should be applied to international contexts and other professional contexts to determine if the findings are generalizable to women advancing in locations other than Australia, and professions other than engineering. In addition, as the model is conceptual, a study to investigate the influence of these factors on each other and on the transition process would extend the understanding of the phenomenon.

Further exploration of the concept of oscillation and downward mobility within the contexts of the careers of engineering women, and women's transition to manager and leader within other professional settings is advocated. As noted by Ng et al. (2007), the current understanding of downward mobility is limited and provides opportunity for future exploration.

An interesting outcome of the contextual review in Chapter 2 was that the majority of women engineers in Australia have international origins. Thus, considering the intersection of ethnicity, culture and gender would provide a more nuanced view of women engineers' experiences of advancement and their conceptualisation of or meanings attached to management and leadership.

As indicated earlier, alternative research methods have the potential to produce further insights. A potential supplementary approach for this study is the capturing of the transition experience in real time. Given the findings of this research that conceptualise the transition to manager and leader as an ongoing process extending well before and beyond appointment to the first managerial and leadership role, this approach brings with it its own challenges. However, exploring the experiences of women engineers currently considering their move to manager and leader, or in the initial phase of a management and leadership role may offer additional insight. Techniques such as combining interviews with reflective participant journaling, such as that used by Atewologun (2011) or structured observation or shadowing of participants as per Fletcher (2001) have the potential to provide data supplementary to that generated in the study.

Finally, more detailed consideration of the heterogeneity of industries and organisations employing women engineers is suggested. Alternative sampling techniques enabling the comparison of women engineers' experiences in different types of engineering organisations and employing industry sectors may facilitate the deeper exploration of the impact of industry and organisational characteristics on women's experiences.

8.7 Concluding Remarks

This research adopted a phenomenological approach to build the understanding of the careers of senior women engineers, specifically those that had become managers and leaders. Semi-structured, in-depth interviews were held with twenty-two women engineers occupying positions of management and leadership in technical organisations in Australia. The accounts of the women were interpreted to develop an understanding of transition to manager and leader as a complex and ongoing process, represented by the *Transition Continuum Model*. In addition, insight was gained regarding women engineer's perceptions of management and leadership roles and their management and leadership orientations. The research findings make several contributions to academic knowledge, with implications for organisations and individuals.

The study began as a desire to understand of the experiences of other women engineers that had advanced in their careers. At the commencement of the project, I stood at an apparent paradox between research emphasising the engineering profession as an uncomfortable and difficult place for women, and my own positive experience. Having completed this project, by way of the phenomenological and feminist approach taken and my own transitions experienced during this work, my perspective has been transformed. I have a deeper understanding of my own career experience - recognising some aspects of it in the research findings. I have a greater appreciation of the difficulties encountered by senior women in the engineering profession, and have a profound respect for their tenacity and commitment. Further, my understanding of becoming a manager and leader has changed. Rather than something that is achieved, finite, and perhaps aligned with a traditional masculine view, I appreciate the variety and fluidity within career advancement, and view it as process "encompassing both change and continuity" (Cohen, 1997, p. 335) influenced by past experiences and future possibilities. I look forward to the future possibilities of further research and continued transformation.

Appendices

Appendix A – The Researcher’s account of her transition from engineer to manager and leader

Early Career

After graduating from university, I started working as a graduate mechanical engineer at an Engineering, Procurement and Construction (EPC) organisation in Perth, Western Australia. I worked for this company for three years and spent the majority of time working in project-based teams on the design phase of onshore oil and gas facilities. The first two years were full of great experiences. A highlight was working in a Perth-based project office on the design phase of a small oil refinery and then transferring to the construction phase in Papua New Guinea for 10 months. I was the only non-PNG female living and working on site. I found this both exciting and challenging.

After returning from site, I came back to work in the corporate head office. The market was slow and the company did not have many projects on their books. There were no project based roles available and I was placed temporarily in the Health and Safety department for three months tasked with creating a safety documentation start up package for projects. This was an incredibly boring role and an anticlimax after having been absorbed in the dynamic environment of design and construction. After taking a period of leave to travel overseas, I returned to the organisation briefly to another uninspiring role and then sought employment elsewhere.

During this time, I had attended an evening seminar titled ‘Love Your Work, Reclaim Your Life’ which had a huge impact on my thinking about the type of work that I wanted to do and the type of organisation that I wanted to work for. I applied for a job via an online website at a small consulting firm specialising in safety, risk and reliability services for the oil and gas industry. I didn’t have experience in these particular services, but my time in design and construction of oil and gas facilities, coupled with offshore experience from university vacation work made me desirable to this consultancy. Many of their engineers had never seen or walked through the equipment or facilities that they were advising on. I

wasn't concerned about my lack of direct experience as I knew that I could learn this on the job. Most attractive to me was the ethos of this organisation. It was small, independent, and young with a relatively flat hierarchy. The organisation was not large –around 40 engineers working across three service groups. Two of the engineers who started the company still worked as Team Leaders / Technical Directors (Leadership Team) in the Perth office. One of them was to be my direct supervisor. They offered a flexible work schedule, emphasised output over input and provided fresh fruit, a chill-out room and an on-site masseuse a few times a week. The leadership team and employees were young. Most people were in their late 20s and 30s which was a refreshing contrast from my previous organisation which seemed to be the realm of short, bald, middle aged men.

First Management Role

I worked as a senior engineer for 18 months and I found the work challenging and interesting. Over this period, my group expanded from 5 engineers to about 15 engineers and software developers. Work was plentiful with the concurrent development of several large LNG projects in Western Australia. Our group became specialists in the optimisation of LNG projects in Australia and internationally, while also trying to access other facets of the energy industry.

After about 18 months, I became the Team Leader of my group. My team of engineers and software developers ranging from new graduates to Principal Engineers. I was approached to fill the Team Leader role by the company leadership team. I wasn't aware that the position was available to apply for. I can remember in an earlier performance appraisal stating that I wanted to be CEO of the company. I'm not sure that this was actually the case, but I was ambitious and wanted to have an influence on the direction and ethos of the consultancy. I was also very interested in people, and helping younger engineers develop and navigate their careers. The incumbent Team Leader was a company founder/owner and his moving out of the role, and subsequent changes to organisational structure, were part of preparing the business for sale to a large international company.

The actual practicalities of the 'move' were very simple. The team were informed of the changes and most team members were happy. I got new business cards, a pay rise and stayed sitting in the same desk in the open plan office format. I continued to work on my existing projects and was expected to be billable to clients for about 60% of my hours. The remainder of my time was directed towards achieving the financial targets for the group through managing team performance, business development activities such as client visits, proposal writing, and attending networking events, scheduling team workload, and overseeing development of team members. I also sat on the Leadership Team for the consultancy chaired by the CEO with other Team Leaders, Technical Directors, managers of HR, Finance and Business Development.

I can remember feeling excited about moving to this role. I felt as though I was achieving something and doing so fairly quickly in my career. I was also a bit nervous. How would I know what to do? How would I relate to the more senior members of the group who had more experience than me, or had vested interest in the company as part owners? I was particularly aware of the dynamic with the previous Team Leader. He had moved to a Technical Director role and though no longer had direct management responsibility for the team was still a very large presence. I wondered about how I would 'make my mark'.

I can also remember the challenge of continuing my project work and delivering the client expectations, and achieving the aims of the Team Leader role. I was more interested in the people management / team development side of my work rather than the technical work that I was expected to continue. Although I enjoyed the technical work I felt that the two facets of my work conflicted. However, the reality of work in a small consulting company was that everyone was expected to be billable to clients at least part of the time.

Acquisition of the Consultancy

After being in the Team Leader role for six months, the consultancy was acquired by a large international company. The integration of the consultancy into this large company was difficult and ultimately unsuccessful. To use a colloquialism,

the two organisations were “like chalk and cheese”. The two organisational cultures were diametrically opposed. Our small consultancy was light on prescribed procedure; the new parent organisation was all about systems and compliance. One emphasised people; the other profit at all costs. My role evolved to include integration activities relating to business development, marketing, profit and loss and revenue prediction systems and procedures.

A major challenge in this time was managing the team’s attitudes regarding the integration. Most staff were unhappy about the takeover, and feared that organisational values that they regarded as so important would be eroded. In the long term, their fears were realised and this led to the collapse of the consultancy. At the time, I found it difficult to maintain my integrity – I also harboured these fears but was tasked by my superiors with delivering a message of ‘business as usual’ and ‘no change’.

A further challenge was learning how to use several new online systems relating to finance, business development and team management. I can remember that these were not straightforward nor user friendly. Much time was absorbed learning and then using them to prepare invoices, report on income forecasts and potential work. This was an ill-afforded burden for a small group whose success hinged on being lean and agile.

Expanded Responsibilities

About 3 months after the acquisition, I took on the Team Leader role for the whole consulting unit. The departure of another Team Leader led to a restructure of the leadership team. Our roles were combined and I now had a team of 40 engineers and software developers to oversee, in parallel with the Technical Directors from each of the consultancy’s three functions.

This was a very challenging role. I can identify two main difficulties. The first challenge was that it occurred in the context of a difficult takeover and I battled with decreasing staff morale, and increasing negativity and cynicism toward the parent company and management. The second related to my lack of technical background in the other two consulting functions that I was now managing. I

struggled with feeling credible in the eyes of the senior engineers in these functions and felt like a fraud when visiting clients and pitching for work. It was also difficult to estimate costs and resources work for these areas without a good grounding and I relied heavily on the senior technical people in these groups. The organisation's view was that I would learn from others within the group, but I never felt that I achieved this to a satisfactory level.

I started to look for alternative work options and I left the organisation after 8 months in this role. I decided that I wanted to understand what this experience was like for others and decided to pursue this PhD research.

Retaining a Connection

After leaving the organisation, I took a few months off from work. I commenced my PhD and returned to the organisation in a new guise – as a contracting consultant on an hourly rate. With the loss of several key team members, the organisation was suffering from a 'brain drain' and sought my assistance with technical quality assurance work, integration activities and mentoring of junior staff in my technical area. This enabled me to keep a connection with the profession and with an organisation that I had really enjoyed working for. As a now PhD student, I was grateful for the extra income! This arrangement continued for about two years.

Over the course of this research project, I have returned to engineering work several times in full-time and part-time capacities; in management and support roles. Well into this research project, and after relocating overseas due to my husband's career, an opportunity emerged in London overseeing the operation of the UK branches of a Norwegian consulting company. It had many similarities to the previous organisation – it was small, flexible, innovative and progressive. In fact several people from my previous organisation were now employed by this company and my new boss was the Talent Manager that I had enjoyed a great relationship with. I moved to London and took on the role, commuting back and forth to my husband's residence about every six weeks. My reasons for taking on this role? In retrospect, I was seeking a sense of belonging and significance. For

many women, moving overseas and becoming an expat spouse provides freedom and a chance to try something new. In contrast, my experience was one of loss of identity and purpose: losing professional and personal networks, strong connection to my university, supervisors and peers that had been central to my self-concept. Our mid-term plan was that my husband would relocate to the UK with his organisation, but a sharp fall in the oil price resulted in limited opportunities. A decision was made to relinquish this role and return to his overseas location.

What changed when I became a manager?

At work, the main changes related to the actual work that I did. I did less technical / project work for clients and more administrative work. As noted above, the balance between this work was challenging, particularly as I was more interested in the 'management' tasks but was expected to continue working in a technical capacity.

Another notable change related to relationship dynamics. I moved from being one of the team to running the team. Initially, this was not a problem but relational dynamics became more complex and isolating as the company takeover proceeded and team members began to associate me with the maligned 'management' of the new organisation.

For me, becoming a manager was a positive experience. I enjoyed the new role immensely and I gained satisfaction from progressing in my career. While I enjoyed technical work and was relatively good at it, I was more interested in broader roles within the oil and gas industry. I liked project work, the sense of working in a team towards a common goal and particularly enjoyed tasks relating to personnel development and capability building.

Transition Support

As I took on a management role, some assistance was provided by the organisation. I became a member of the Australian Institute of Management in Western Australia and the company paid for my membership. I commenced their

mentor program for young managers but did not find it that useful and did not complete it. The main issue was having to schedule and travel to meetings with my mentor who was based about in a local council office about 40 minutes out of the city. The meetings were inconvenient and I felt that the divide between local council and the oil and gas industry was too wide. I can also recall attending a one day external course for First Time Managers that was also company funded and some evening seminars at Engineers Australia. Being a small consultancy, there was no formal management development program. It was truly a case of learn by doing, learning from others within the organisation and self-education.

Following the acquisition of the consultancy, I attended a management development training provided by the new parent organisation. This was conducted interstate over a few days. The incongruence between the original consultancy and the parent organisation was very apparent. The course emphasised process and procedure, profit and complicated reporting requirements rather than a focus on client relationships and talent development that had been the backbone of our organisation and consistent with my own interests and values.

A further resource was my relationship with the organisation's Talent Manager. She was a great support for me in the early days. She was approachable and I felt confident in confiding issues and concerns to her. Existing relationships with team members also served to facilitate my transition. Having been one of the team and having worked with many of them on various projects, they appreciated my work ethic and approach, my technical knowledge, my belief in personnel development and support as the route to successful business, and my flexibility and understanding nature. These relationships gave me a sense of security and of having a solid foundation as I became a fledgling manager. This was in contrast to the role that I took on in London several years later, where I came in to the role as an outsider, with no prior relationship to the team. This was a more difficult adjustment for me as I had to quickly establish my credibility and gain respect and cooperation of the team.

On reflection, I would have liked more support during this transition and had there been more support from the organisation and had I been more aware of and proactive in seeking the assistance and guidance that I needed, I may have continued in the management and leadership path instead of leaving it prematurely. I would have benefited from seeking out other emerging managers and leaders in engineering and sharing this experience. In terms of organisational support, I would have liked more careful guidance and support instead of the somewhat 'she'll be right' attitude of the incumbent leadership team. In particular, ensuring a solid grounding and understanding of the additional technical functions of the consultancy that I came to manage would have been beneficial.

Gender and Advancement

Being a woman engineer did not impact my progression to the Team Leader roles that I occupied. In the first years of working with the consultancy, it was a young, progressive and social workplace and had a high percentage of women engineers. Thus, being a woman was not a barrier to accessing these roles. Of more importance was fitting in with the other organisational members. For example: social activities did mostly revolve around drinking alcohol. Friday afternoon drinks were provided by the company while we wrapped up the week's work. We regularly gathered for after work drinks at the local hotel. Being a young engineer, partnered but with no children, I was able and willing to take part and enjoyed the social side of the organisation. Further, many of the senior engineers in the company were sports oriented and I fit in well as I was rowing competitively during this time.

I did not stay on with the integrated organisation, but I feel that further progress within the Australian branch would have been limited by my gender. In addition to our consultancy, the parent organisation rapidly grew its presence in Australia through acquisition. Most of the acquired companies provided para-professional services and had highly masculine, working class cultures. The new management of the Australian branch was derived from these organisations. From memory,

there were no women in senior management roles, aside from those working in human resources and finance, and advancement would have been difficult.

Reflections

My early career consisted of a variety of roles. I was not a technical specialist, rather enjoyed working in the oil and gas industry and the breadth of roles offered. A combination of market factors and a sense of underutilisation and boredom promoted an organisational move. I was driven to find both an organisation that I felt I belonged in and interesting and meaningful work.

My move to manager wasn't intentional, but I did harbour general ambition to progress in my career. I was very academic at school and did well at university, and so expected that I would achieve success in my work life. I was motivated to take these roles through my interests in team development, in working with others to achieve their career goals and my desire to create a great workplace for people.

Becoming a manager was a positive experience for me. It was an achievement that engendered pride, satisfaction and fulfilment. Of course, there were challenges and these were primarily associated with accommodating the demands of the role, balancing my own interests with organisational priorities, lack of knowledge in some areas, and navigating relationships. The image that comes to mind when I think about this time in my work-life is that of a baby deer stumbling about on long limbs - uncoordinated and uncertain, barely managing to walk but desperately wanting to break into an elegant gallop.

I am surprised at the emotions that have surfaced during the writing of this reflective piece. I remember this time as a good time in my working life – I think that I was well regarded within my organisation and by my clients, I was progressing in my career, assuming positions with increasing responsibility and remuneration. However, under the surface I have discovered some feelings of disappointment, and perhaps a touch of regret about unfinished business.

Appendix B – Invitation to Participate in Research Project



Invitation to Participate

Transition from technical engineer to manager and leader – women's experience in Australia

My name is Melissa Marinelli and I am currently completing research for my Doctor of Philosophy with the Graduate School of Business at Curtin University of Technology in Perth, Western Australia. I am investigating the advancement of women engineers to managers and leaders in technical organisations around Australia and am seeking participants for my research that meet the following criteria:

- Degree qualified engineer.
- Female.
- Currently working in Australia for a company employing over 100 people.
- Currently working as a manager and leader in their organization, ie: an organizational role that includes management, leadership or business responsibilities.
- Has worked in this capacity for a minimum of twelve months.

Purpose of Research

This research will document the experience of women engineers working in Australia who have become managers and leaders, to achieve the following goals:

- understand the experience of transition to manager and leader for women engineers;
- understand how management and leadership in technical organisations is conceptualized by those that have experienced it;
- uncover the factors that affect the transition to manager and leader for women engineers; and
- identify implications for policy and practice to advance women in engineering.

The study aims to give a voice to women in a non-traditional occupation who have advanced in their profession and to provide a broader and more inclusive understanding of management and leadership in the engineering profession.

Your Role

To understand what it is like to move from engineer to manager and leader, input from those that have experienced this move is needed. Data for this study will be collected through interviews with around 30 participants.

If you choose to participate in this study, I will ask you about your experience of moving from a technical engineer to manager and leader in your organization.

Participation will include a one hour meeting at a suitable and comfortable place. The interview will be taped to help with transcription and you will be given a copy of the interview to check and make changes. A summary of the results of the study will be available to you at the conclusion of the study.

Participation is voluntary and I will ask you to sign a consent form prior to any data gathering.
You are able to withdraw from the study at any stage.

Further Information

For further information on this project, please contact Melissa Marinelli by phone: 0422 190 874 or by email: melissa.marinelli@postgrad.curtin.edu.au or contact the project supervisor Dr Linley Lord by phone: (08)9266 4239 or by email: linley.lord@gsb.curtin.edu.au

This study has been approved by the Curtin University Human Research Ethics Committee (Approval Number GSB – 06 – 09). If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth 6845 or by telephoning 9266 9223 or by emailing hrec@curtin.edu.au.

To Participate

To express your interest in participating in this research project, please contact Melissa Marinelli by phone: 0422 190 874 or by email: melissa.marinelli@postgrad.curtin.edu.au

I will contact you regarding interview arrangements following your registration of interest.

If you are unable to participate in this study, I would be happy for you to refer this Invitation to Participate to your colleagues.

Thank you

Melissa Marinelli
PhD Candidate
Graduate School of Business
Curtin University of Technology

Email: melissa.marinelli@postgrad.curtin.edu.au

Phone: 0422 190 874

Appendix C – Research Information Sheet and Consent Form



Participant Information Sheet

Transition from technical engineer to manager and leader – women's experience in Australia

My name is Melissa Marinelli and I am currently completing research for my Doctor of Philosophy with the Graduate School of Business at Curtin University of Technology.

Purpose of Research

I am investigating the advancement of women engineers to managers and leaders in technical organizations in Australia.

This research will document the experience of women engineers working in Australia who have become managers and leaders, to achieve the following goals:

- understand the experience of transition to manager and leader for women engineers;
- understand how management and leadership in technical organisations is conceptualized by those that have experienced it;
- uncover the factors that affect the transition to manager and leader for women engineers; and
- identify implications for policy and practice to advance women in engineering.

The study aims to give a voice to women in a non-traditional occupation who have advanced in their profession and to provide a broader and more inclusive understanding of management and leadership in the engineering profession.

Your Role

To understand what it is like to move from engineer to manager and leader, input from those that have experienced this move is needed. Data for this study will be collected through interviews with around 30 consenting participants.

I will ask you about your experience of moving from a technical engineer to manager and leader in your organization.

Participation will include a one hour meeting at a suitable and comfortable place.

The interview will be taped to help with transcription and you will be given a copy of the interview to check and make changes.

A summary of the results of the study will be available to you at the conclusion of the study.

Consent to Participate

Your participation in this research is entirely voluntary and you can pull out at any time without a problem. When you have signed the consent form I will assume that you have agreed to participate and allow me to use your data in this research.

Confidentiality

The information you provide will be kept separate from your personal details, and only I will have access to this. The interview transcript will not have your name or any other identifying information on it and in adherence to university policy, the interview tapes and transcribed information will be kept in a locked cabinet for five years, before it is destroyed.

Further Information

If you have any questions before, during or after the interview please call Melissa Marinelli on 0422 190 874.

This study has been approved by the Curtin University Human Research Ethics Committee (Approval Number GSB – 06 – 09). If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth 6845 or by telephoning 9266 9223 or by emailing hrec@curtin.edu.au.

Consent Form

Transition from technical engineer to managers and leaders - women's experience in Australia

I _____ have read the information on the attached information sheet and understand the purpose and procedures of the study. Any questions I have been asked have been answered to my satisfaction.

I agree to participate in this study but understand that I can change my mind or stop at any time.

I understand that all information provided is treated as confidential.

I agree for this interview to be recorded.

I agree that research gathered for this study may be published provided names or any other information that may identify me is not used.

Name _____ Signature _____
Date _____.

Investigator _____ Signature _____.

Appendix D – Interview Questions



Interview Questions

Transition from technical engineer to managers and leaders - women's experience in Australia

Interview Number:

Interview Date and Start Time:

Section 1: Interview Questions

1. To begin with, can you give me a 5 minute summary of your life story?
2. Can you tell me about your current role?
3. How did you get to this role?
4. Can you tell me about what interested you in your current role?
5. Can you tell me about your experience in moving from a role as a professional engineer to your first role as manager / leader?
6. Can you tell me about your experience in moving from that first management / leadership role to your current role?
7. What advice would you give to someone that was considering the transition from technical engineer to manager?
8. What would you tell someone that was a new manager / leader?
9. Can you think of someone that you consider to have made a successful transition to manager / leader. Tell me about that person.
 - a. Why do you see them as successful?
 - b. Do you consider that your transition was successful?
10. What difference, if any, do you think that gender has made to your career to date?
11. Is there anything else that you would like to tell me?

Section 2: Interview prompts – areas to cover (may come out in other questions)

- Demographics – age, qualifications, family status
- Support systems - What was available? What did you use? Was it helpful?
- Timing – how far into career? How long did transition take?
- Triggers / influences to move to manager / leader?
- What did becoming a manager / leader feel like?
- What changed as you moved to manager / leader? Both inside and outside of work.
- What does being a manger and leader in your company mean to you?
- Would you define yourself as a manager and leader in your organization?

Appendix E – Sample ‘Interview Reflection’ Memo

TRANSITION FROM TECHNICAL ENGINEER TO MANAGER AND LEADER: WOMEN’S EXPERIENCE IN AUSTRALIA

TRANSCRIPT: P-2
MEMO NUMBER: P2-1
MEMO SUBJECT: REFLECTION ON INTERVIEW
DATE: 19 OCTOBER 2009

INITIAL IMPRESSIONS

Determined	Strong identity as engineer	Interested in development of people
Pro-active	Clear definition of role	Makes decisions to get where she wants to go
Self reliant / independent	Taking on responsibility	Strong family support
Impatient tending to aggressive	Power / influence	Confidence

BACKGROUND

Participant is a senior executive and shareholder in a privately owned international engineering company. The company provides engineering services for a variety of industries. The participant is involved in the infrastructure sector. Her role has several well defined facets. She is responsible for people management (multi-disciplinary team), project management and delivery and business development.

The company has recently undergone a merger with a South African company.

OVERALL IMPRESSION

The overall feel of her experience of moving from engineer to manager / leader is *drive and progressive steps playing to her strengths*.

The participant is a very driven and determined person. She has moved through various roles in the engineering field with a view to progressing up the corporate ladder. She has changed jobs several times in order to further this progress – if an opportunity was not available at her workplace, she had no hesitation in seeking the opportunity elsewhere. She is attracted to power and influence. She likes things ‘done properly’. Her current role is clearly defined by the company.

She seems to have a natural management / leadership persuasion – “I have certain areas of technical specialization, but that’s not my strength”.

She has received great support from her husband and family to progress her career.

REFLECTION ON CONTENT

After the first reading, I feel that I have a good picture of her role as manager and leader: what she is responsible for, what tasks her role involves, how the role fits into the company, how she feels about being a manager and leader, how she feels about her current role in the context of the company that she works for.

The experience of becoming a manager and leader is covered. The participant talks about the roles that she took and the tasks that her managerial roles entail, but does not really reflect on the experience of becoming a manager / leader. Or maybe she does - maybe the lack of expression of the feeling is important. Does this say something about the person – task driven? She talks about how she has changed: becoming more confident, direct and decisive and less inclined to seek approval from others.

- the drivers / triggers of her move to management are raised: was offered opportunity to lead a team, took it and found she enjoyed it and was good at it. This encouraged subsequent moves that became increasingly concerned with progress, gaining power and influence.
- Selection / recruitment progress is clearly explained.
- Unlike P-1, the participant does not talk about the challenges of the move to management. Is this because of the time frame? The move to an initial management role was more than 10 years ago. Not as fresh in the memory as someone who has made the move in the last few years. Also indicative of her “don’t wallow in self pity, get on with it mentality”.

The view of a manager and leader in engineering from the participant’s perspective is clear. There is a clear understanding of her own role, the taking on of responsibility by a manager. There is discussion of the more senior executive, the board, the inner circle of decision making and influence which illuminate her view of a manager and leader in engineering. There is some reflection on the view of managers / leaders by the ‘followers’ which is interesting. An awareness that the image portrayed does not match the motivation within.

The factors influencing her transition to manager and leader are touched on. Key factors that stand out to me are i) her personal strength, drive and tenacity, ii) the importance of an organized Organisation (clear structure, progression path), iii) support from family “essentially, I’ve had a wife” and iv) identification of her strengths and preferences and playing to those strengths.

REFLECTION ON INTERVIEW PROCESS

Completed second interview before reviewing the first – so interview sections are still explicit and the first section is still disjointed.

The questioning in the first section is a little more open and as a result more information was offered up by this respondent in this section.

In next interview, I want to try to get deeper into the “becoming” a manager and leader. Some possible questions:

- Do you define yourself as successful?
- Who or what would you attribute to their success / progress?

Appendix F – Sample of Data Analysis

Table F-1: Data Analysis Steps 1 to 3 - Identifying Significant Statements, Assigning Formulated Meanings

Sample Interview: M5, 20 of 75 Significant Statements

Statement Number	Significant Statement	Formulated Meaning
M5-1	I worked my way through predominantly as a [discipline 1], [discipline 2] engineer up until 1999 when I was seconded from [Current Company] to [Company 1] for four years. So that was definitely a highlight for me [Current Company] recognising myself as a person with potential and sponsoring me to go into [Company] for four years in [Overseas location].	An overseas secondment was a recognition of my potential by the company.
M5-1a	I worked my way through predominantly as a [discipline 1], [discipline 2] engineer up until 1999 when I was seconded from [Current Company] to [Company 1] for four years.	I worked as a technical engineer for 12 years
M5-2	that was a great experience, working as an engineer in a very diverse environment, culturally, gender, language	Working overseas in a diverse environment was an important developmental experience.
M5-3	I came back to [Current Company] in 2003 and through 2003 and 04, that's when I actually had some of my first management experience, direct people management experience, and it lead me to lead [discipline] engineer for [major project] front end design. That was managing only a small, only me and one other in the [current company] team but it was managing on the contractor's side, a dozen or so [discipline] engineers.	My first management experience was as a Lead Engineer. I managed engineers internal and external to my company.

M5-4	After that I came back into [current company] and continued to... ramped up my management experience. I then had a team of about 8 people in [current company], about a \$4million budget and that was pretty exciting.	I ramped up my management experience with a larger team and budget.
M5-5	Managed to actually build the team and to attract a number of staff that I'd worked with on the [major project] ex-[Company 2] staff.	I built my team using the good relationships that I had formed with people that I had worked with previously.
M5-5a	And they paid me the compliment of wanting to come in and work with me in my team.	People that I had worked with paid me the compliment of coming to work with me again
M5-6	The most interesting for me was an engineer that I admired – very good technically – and he was, I think – how old was I?... I was 34/35 years old and he was 55 years old... and that was a real compliment.	It was a compliment to have an older, very technically competent engineer join my team.
M5-7	I had a child, my little boy [child's name] in 2005, that was absolutely a highlight (laughs) and took a year's maternity leave, came back part-time and I guess [current company] have been pretty clear that they will not offer a management role on under four days a week. I only wanted to work three days a week so at that point I went back into a technical role.	I returned to work in a part time technical capacity after having my child
M5-8	we had a requirement to be in the northern hemisphere in Europe and luckily, well [current company] and [Company 1] both offered me a position overseas on a fulltime basis- that was a fulltime position then as, not as, Lead [discipline 3].	I moved overseas for family reasons and was offered a full-time lead engineer role with my company.
M5-8a	we went to [overseas location] with [current company] and I worked for [colleague's name] who was my Engineering Manager on the [major project].	I worked for someone who I had worked for before.
M5-9	That was quite a challenging role because I was outside of my core discipline	The role was challenging as I was not in my core discipline
M5-9a	there were some interesting issues with managing the contractor and managing my team as well. Small team again – only three	The role was challenging as there were issues with managing the team.

	people – but the, on the [discipline] side within [Contractor Company] they peaked at about 120 engineers.	
M5-10	We returned to [Australian City] and after working very hard, very long hours, and having a very supportive husband who stayed at home in [overseas location], I felt that [child's name], my son had completely missed out during that 13-15 months while I was in [overseas location] so I've come back to three days again and I've dropped back into a technical role at this point.	I returned to a part-time technical role after returning from overseas.
M5-10a	I think it's an interesting perspective from the point of view from your research, to understand the different pressures that women have in their lives, trying to juggle their career aspirations with the work/life balance situation and their desire, some of them have a desire such as myself, to be a primary care giver.	I juggle my career aspirations and my desire to be the primary care giver.
M5-11	Moving into that role was actually a very easy move for me because I'd actually, when I'd been working for [Company 1] in [overseas location], I'd actually built a relationship with a lot of the [Contractor company] people during our [major project].	It was easy to move into my first managerial role as I had built relationships with people on previous projects.
M5-12	I knew the people, they knew me and I think there was respect on both sides as to our abilities.	I knew the people, they knew me and there was respect on both sides as to our abilities.
M5-13	As a manager, I like to think that I have a very inclusive management style rather than a real command and control style,	I have an inclusive management style, as opposed to a command and control style.
M5-14	there was a lot of learning in terms of enforcing of contractual requirements, at the same time as working with the people, but we were all working to deliver a good product at the end of the day and we were all very motivated to do that.	I learnt a lot about enforcing contractual requirements while maintaining relationships with people. This was assisted by our common motivation to deliver the project well.
M5-15	The exposure to the politics was very interesting, the dealing with the [Company Name] as joint venture arrangement trying to get to the point where we would actually take final investment decision on [major project] was interesting process.	As a new manager, the exposure to project politics was interesting.
M5-15a	The people management, it wasn't a big issue	People management was not a big issue

M5-15b	Whenever I've been in my core discipline because it's generally been moving up to manage people that I've already had relationships with, that's been very, very easy.	Managing others from my core discipline is easy
M5-16	Deleted as a duplicate	
M5-17	The challenge has actually really been on the [Project Name] [non-core discipline] role where I was out of core discipline and I didn't have my technical skills to really fall back on and in terms of gaining credibility	It was challenging to be a manager outside of my core discipline as I did not have my technical skills to fall back on and gain credibility with.
M5-18	Deleted as a duplicate	
M5-19	That was actually deliberate. So [colleague's name], who was the Engineering Manager when he was thinking about if the team could accommodate my requirement to be in closer to Europe, he created my role to address a particular issue that he had in the team.	My role was created by the Engineering Manager to address an issue that he had within his team.
M5-20	he also did it to see how I would grow and mature given this challenge.	I was given the role as a developmental experience

Table F-2: Data Analysis Step 4 - Relate and cluster formulated meanings into categories and themes

Sample Interview: M5

Theme	Category	Sub-categories	Formulated Meaning	Statement Number
Individual Characteristics, Preferences	Preferences	Technical / Engineering	Returning to technical work is not an issue because I enjoy it.	M5-36
Intrinsic and Extrinsic Motivations	Power, Influence and Control	Influence	The loss of influence that occurs when returning to a technical role is frustrating.	M5-37
			I exercise indirect influence using my relationships with people in the leadership team.	M5-38
			I am working to increase the profile of technical people as I believe that technical people should occupy positions of influence in a company.	M5-44
			People go into management to have the ability to influence.	M5-50
	Self-actualisation		I will need to move back to management if I want to realise my potential.	M5-46
	Ambition (Explicit or Implied)		I call my strategy 'muddling along'. If something comes up I take it	M5-59a
Influence of Others	Contacts and Networks	Internal networks	I built my team using the good relationships that I had formed with people that I had worked with previously.	M5-5
			I worked for someone who I had worked for before.	M5-8

		Networks of women	I was a member of the company's professional women's network.	M5-28
			It has been useful to connect with women through women's networks that have experienced the juggle of home and career.	M5-65
			A female network provides access to role models and a feeling of sisterhood and belonging.	M5-66
			My ability to network outside of business hours has been curtailed by having a child.	M5-67
			Senior women in my company are very supportive of the women's network.	M5-74
		Providing Support	As a young engineer you do not have competency and networks to cope with difficult workplace situations.	M5-30
			It has been useful to connect with women through women's networks that have experienced the juggle of home and career.	M5-65
			A female network provides access to role models and a feeling of sisterhood and belonging.	M5-66
		Source of Opportunity	I worked for someone who I had worked for before.	M5-8
	Relationships within the workplace	Team	I built my team using the good relationships that I had formed with people that I had worked with previously.	M5-5
			It was easy to move into my first managerial role as I had built relationships with people on previous projects.	M5-11

			I knew the people, they knew me and there was respect on both sides as to our abilities.	M5-12
			When managing in my core discipline, managing others is easy	M5-15b
			I found it stressful to manage an older male engineer with set views on how things should happen.	M5-22
		Broader Management	Managers often make assumptions and decisions on behalf of people	M5-32b
		Opportunity	My role was created by the Engineering Manager to address an issue that he had within his team.	M5-19
			Managers often make assumptions and decisions on behalf of people	M5-32b
	Coaching Mentoring	Advice to others	A good mentor to assist with confidence, impression management, managing upwards is important.	M5-54
			A mentoring relationship requires trust, an open relationship and cannot be forced.	M5-63
		Had a mentor - informal	I have not had formal mentors as it takes time to participate in these programs and I have not dedicated time to career planning.	M5-57
			Contact with my mentors is ad-hoc and needs driven.	M5-61
			I have established informal mentoring relationships with people that I have worked with.	M5-64
	Supportive Family		I would consider a full-time role now.	M5-32a
			My husband supported me while I worked full-time with a small child.	M5-68

	Sponsor / Advocate		Having a supportive partner is mandatory to maintaining my career.	M5-71
			It is important to have an advocate as a part-time worker as there is a risk of being forgotten.	M5-33
			I have had a number of influential people in my career.	M5-58
			I was offered an opportunity by an advocate to broaden my experience in the business context.	M5-59
			I did not take the opportunity and it was a mistake.	M5-60
Relational Perceptions and Attitudes	Validation and Recognition	Recognition of Potential	An overseas secondment was a recognition of my potential by the company.	M5-1
		As a Manager	It was a compliment to have an older, very technically competent engineer join my team.	M5-6
	Credibility / Reputation / Respect	Gaining respect	People that I had worked with paid me the compliment of coming to work with me again	M5-5a
			I knew the people, they knew me and there was respect on both sides as to our abilities.	M5-12
		Credibility	It was challenging to be a manager outside of my core discipline as I did not have my technical skills to fall back on and gain credibility with.	M5-17
			As a young engineer you do not have competency and networks to cope with difficult workplace situations.	M5-30
	Leveraging Relationships		I learnt a lot about enforcing contractual requirements while maintaining relationships	M5-14

			with people. This was assisted by our common motivation to deliver the project well.	
			I exercise indirect influence using my relationships with people in the leadership team.	M5-38
Building Knowledge and Skill	Developmental roles or experiences	Site Work, Overseas Work	Working overseas in a diverse environment was an important developmental experience.	M5-2
		Broadening Experience	I was offered an opportunity by an advocate to broaden my experience in the business context.	M5-59
			I took the option that allowed me to stay in my comfort zone	M5-61
		Building managerial experience	I was given the role as a developmental experience	M5-20
	Professional Development	Training - Leadership	A formal leadership course provided by the company was useful in becoming aware of my leadership style, and learning how to influence and motivate staff.	M5-55
Pathways to Manager	Move to first management role	Solid grounding	I worked as a technical engineer for 12 years	M5-1a
	Becoming a Manager (subsequent roles)	Building Managerial Experience	I ramped up my management experience with a larger team and budget.	M5-4
		Oscillation	I returned to work in a part time technical capacity after having my child	M5-7
			I moved overseas for family reasons and was offered a full-time lead engineer role with my company.	M5-8

			I returned to a part-time technical role after returning from overseas.	M5-10
			I would consider a full-time role now.	M5-32a
			Returning to technical work is not an issue because I enjoy it.	M5-36
			The loss of influence that occurs when returning to a technical role is frustrating.	M5-37
			I will need to move back to management if I want to realise my potential.	M5-46
		Feet in Both Camps	At the moment, I can work in either technical or managerial roles.	M5-43
	Full-time to Part-time	Part-time Technical	I returned to a part-time technical role after returning from overseas.	M5-10
			I work in excess of the part-time hours that I am paid for.	M5-31
			Part-time work may be better suited to technical roles.	M5-73
		Performance	It is difficult to compare the performance of someone who works part-time and someone who works full-time	M5-31b
		Progress	In the future I am intending to increase my working hours and do not want to be discounted from opportunities because I am currently working part-time.	M5-32
			It is important to have an advocate as a part-time worker as there is a risk of being forgotten.	M5-33
			I resigned my role as I intended to return in a part-time capacity and wanted to give the	M5-39

		Organisational support	team certainty about their management and direction going forward	
			Part-time work to accommodate caregiving will remain as a minority issue until men participate.	M5-34
			Company systems and social expectations support my requirement for part-time work. Men may face additional barriers.	M5-75
The Organisation	Organisational Culture & Work Environment	Retention and advancement of women	I worked for a company which placed importance on gender diversity.	M5-29
	Promotion Pathways	Technical Pathways	I am working to increase the profile of technical people as I believe that technical people should occupy positions of influence in a company.	M5-44
			The technical ladder is seen as the lesser career path.	M5-49
			Technical people do not have influence on the company direction as they do not occupy leadership positions.	M5-51
		Visible Pathway to Manager	The typical pathway to management roles involved working and being developed in a technical capacity. If there is aspiration upon reaching a certain job level, they are flipped to a management role.	M5-47
	Institutionalised Structures, Organisational Norms	Career Ladders	The technical ladder is seen as the lesser career path.	M5-49
			Technical people do not have influence on the company direction as they do not occupy leadership positions.	M5-51

	Organisational Policy	Flexible work	Company systems and social expectations support my requirement for part-time work. Men may face additional barriers.	M5-75
Impact of Gender on Career and Advancement	Motherhood	Managing motherhood and work - Choice, compromise, juggle	I juggle my career aspirations and my desire to be the primary care giver.	M5-10a
			I don't think you can have it all. You have to compromise	M5-31a
			My ability to network outside of business hours has been curtailed by having a child.	M5-67
			Women have the ambition and ability to make it to management but are forced to make choices about family.	M5-72
			I chose to become the primary carer when I had my child	M5-76
		Managing motherhood and work - Drawing on support networks	Women in my company have juggled career and family so the path has been forged	M5-65
	Intersectional issues	Gender and age	I found it stressful to manage an older male engineer with set views on how things should happen.	M5-22
	Gender as an advantage	Different approach / perspective	I think that women have an advantage through their conciliatory approach	M5-27b
The Technical Link	Technical Competence and Grounding		The role was challenging as I was not in my core discipline	M5-9
			When managing in my core discipline, managing others is easy	M5-15b
			It was challenging to be a manager outside of my core discipline as I did not have my	M5-17

			technical skills to fall back on and gain credibility with.	
			It is not mandatory to have specific technical background as a manager.	M5-23
			Technical competence is a criterion for promotion within engineering.	M5-24
			Technical competence is of particular importance for new managers in people management roles.	M5-25
			As a young engineer you do not have competency and networks to cope with difficult workplace situations.	M5-30
	Retaining the Link	Enjoying the Technical	Returning to technical work is not an issue because I enjoy it.	M5-36
		Return to technical work in the future	At the moment, I can work in either technical or managerial roles.	M5-43
	Impact of Transition on Self	Identity	Management / Leadership Style	M5-13
			Engineer Identity	M5-74a
		Adjustments	Change in behaviour - Working collectively	M5-14
			Change in behaviour - Suppressing natural tendencies	M5-27a
			Learnings and Realisations	M5-15

			As a new manager, I learnt that engineers are motivated by recognition and challenging work.	M5-26
		Learnings and Realisations - Gender differences	I became aware of gender differences in communication through resources provided by the company.	M5-53
		Changes within - Self-awareness	A formal leadership course provided by the company was useful in becoming aware of my leadership style, and learning how to influence and motivate staff.	M5-55
	Challenges		I found the role stressful due to the personnel conflicts that occurred.	M5-21
What A Manager / Leader Does**	Managing Others		My first management experience was as a Lead Engineer. I managed engineers internal and external to my company.	M5-3
			The role was challenging as there were issues with managing the team.	M5-9a
			People management was not a big issue	M5-15a
			Managing others from my core discipline is easy	M5-15b
			It was challenging to be a manager outside of my core discipline as I did not have my technical skills to fall back on and gain credibility with.	M5-17
			As a new manager, I learnt that engineers are motivated by recognition and challenging work.	M5-26
	Building a Team		I am disappointed that the team I built has disintegrated since I left and needs to be built up again.	M5-40

Concept of Manager and Leader**	Gendered Management and Leadership Styles		I think women have a more conciliatory than confrontational approach	M5-27
	Part-time Manager		I think that you can be a manager in a part-time role if you have a strong second in charge.	M5-41
	Required Skills		The skills required for management include people skills, the ability to communicate, budgeting and planning.	M5-48
Context**	Gendered Profession		At my job level there are 10% women.	M5-35

**These themes are additional to the 10 Phenomenological Themes. They are used to capture statements relating to context, or the conceptualisation of management and leadership, and management and leadership work.

Appendix G – Definition of Phenomenological Themes

Phenomenological Theme	Definition
Individual Qualities, Abilities & Preferences	This theme describes the characteristics of the women that influence their transition to senior roles. It includes aspects of personality, preferences and abilities that steer them towards a management role and act as agentic resources during their transition.
Intrinsic and Extrinsic Motivations	This theme describes the drivers for seeking out, deciding to take and choosing to remain in a managerial/leadership role. This theme includes both intrinsic and extrinsic motivations and statement relating to fulfilling individual desires.
Influential Relationships	This theme captures statements relating to the key relationships that influence the women's transition to management/leadership roles.
Relational Perceptions & Attitudes	This theme captures references to the 'by-products' of relationships – those aspects created at the interface of the individual and others. Distinct from specific relationships and roles, this theme encompasses the way women use relationships to their advantage and are affected by interactions with others inside and outside of their workplace.
Building Knowledge & Skill	This theme captures statement relating to the accumulation of knowledge and gathering of experience. It includes the ways in which knowledge and skill are built, and the influence of human capital on the women's transition.
The Organisation	This theme describes the influence of the broader organisation on the women's transition experience. Distinct from people within the organisation (captured in the themes: i) Influential Relationships and ii) Relational Attitudes and Perceptions, this theme brings together data relating to the structural aspects of the

	organisation including organisational structure, policy, process and culture.
Pathways to Manager & Leader	This theme captures the varied and dynamic ways in which women have reached their management roles. Data relating to promotion pathways is also captured here.
Influence of Gender on Career & Advancement	This theme captures data relating to being a woman in a male-dominated profession and views on the influence of this on career and advancement.
The Technical Link	This theme describes the influence of technical work on the women's transition experience. This includes data relating to the enjoyment of technical work, the emphasis on technical development and competence in early career, and the continued link to technical work in later career.
Impact of Transition on Self	This theme describes the internal experience of transition encompassing feelings, changes in perception, thinking and behaviour, mind-shifts and data relating to identity.

Appendix H – Phenomenological Theme Category Listing

The table presents categories in the left-hand column, and related sub-categories in the right-hand column.

Theme 1: Individual Qualities, Abilities and Preferences	
• Preferences	<ul style="list-style-type: none"> ▪ Technical/Engineering ▪ Broader interests ▪ Organiser ▪ Enjoying people/relationships ▪ Problem solver ▪ Values
• Personality	
• Abilities	
Theme 2: Intrinsic and Extrinsic Motivations	
• Self-driven	
• Ambition	
• Power, Influence and Control	<ul style="list-style-type: none"> ▪ Autonomy ▪ Influence ▪ Wanting responsibility ▪ Frustration with others ▪ Desire for power
• Altruism	<ul style="list-style-type: none"> ▪ Making a difference ▪ Developing others
• Self-actualisation	<ul style="list-style-type: none"> ▪ Luck, Power of Attraction
• External Recognition / Status	
• Challenge	
• Congruence / Alignment	
• Lifestyle	
Theme 3: Influence of Others	
• Within the workplace	<ul style="list-style-type: none"> ▪ Boss

	<ul style="list-style-type: none"> ▪ Female Boss ▪ Peers ▪ Team ▪ External stakeholders ▪ Broader management ▪ Support <ul style="list-style-type: none"> • Source of support • Lack of support ▪ Opportunity ▪ Challenging relationships ▪ Conditional access to help ▪ Absence of women at work
<ul style="list-style-type: none"> • Mentoring / Coaching 	<ul style="list-style-type: none"> ▪ Had a mentor ▪ Didn't have a mentor ▪ Female mentor ▪ Mentoring others ▪ Advice to others
<ul style="list-style-type: none"> • Contacts and Networks 	<ul style="list-style-type: none"> ▪ External to organisation ▪ Internal networks ▪ Networks of women ▪ Professional Networks and Organisations ▪ Support ▪ Opportunity ▪ Informal ▪ Organised
<ul style="list-style-type: none"> • Role Models 	<ul style="list-style-type: none"> ▪ Being a role model ▪ Didn't have, would have liked ▪ Female role models ▪ Learning how ▪ Possible selves
<ul style="list-style-type: none"> • Supportive Family 	

• Sponsor / Advocate	
Theme 4: Relational Perceptions and Attitudes	
• Credibility / Reputation / Respect	<ul style="list-style-type: none"> ▪ Gaining respect ▪ Related to gender ▪ Credibility ▪ Demonstrating competence ▪ Experience and opportunity ▪ Reputation
• Validation / Recognition	<ul style="list-style-type: none"> ▪ Recognition of potential ▪ Role title / status ▪ As a Manager ▪ Seeking recognition
• Visibility / Getting Noticed	<ul style="list-style-type: none"> ▪ Asking / self-promotion ▪ Networking ▪ Why it's important ▪ Previous work ▪ Extra-curricular
• Changing Relationship Dynamics	
• Relational Approach	<ul style="list-style-type: none"> ▪ Value placed on relationships ▪ Inclusive management / leadership style ▪ Learning from others ▪ Relationships as a resource ▪ Fitting in
• Impression management	
• Gendered Roles	
Theme 5: Building Knowledge and Skill	
• Professional Development	<ul style="list-style-type: none"> ▪ Postgraduate degree ▪ Training <ul style="list-style-type: none"> • Management • Leadership

	<ul style="list-style-type: none"> • Project Management • Women's leadership programs • Military • Technical • Change in thinking ▪ Educating myself ▪ Undergraduate degree ▪ Professional Registration
<ul style="list-style-type: none"> • Learning on the job 	<ul style="list-style-type: none"> ▪ Learning from others ▪ Learning by doing ▪ Exposure to managerial tasks (see Pathways to Manager)
<ul style="list-style-type: none"> • Developmental roles or experiences 	<ul style="list-style-type: none"> ▪ Challenging or difficult roles ▪ Broadening experience ▪ Site work / overseas work ▪ Building managerial experience
<ul style="list-style-type: none"> • Early roles 	<ul style="list-style-type: none"> ▪ Engineering roles
<ul style="list-style-type: none"> • Outside of work 	
Theme 6: The Organisation	
<ul style="list-style-type: none"> • Opportunity and constraint 	<ul style="list-style-type: none"> ▪ Source of opportunity ▪ Acting as a constraint
<ul style="list-style-type: none"> • Organisational Culture & Work Environment 	<ul style="list-style-type: none"> ▪ Gendered organisational culture ▪ Efforts to change culture ▪ Non-communicative / non-interactive ▪ Bullying and conflict ▪ Part-time or flexible work ▪ Sink or swim ▪ Investment in knowledge or training ▪ Long hours culture
<ul style="list-style-type: none"> • Promotion Pathways 	<ul style="list-style-type: none"> ▪ Visible pathway to manager <ul style="list-style-type: none"> • Transparent, clearly defined, structured

	<ul style="list-style-type: none"> • Typical path within organisation • Lack of transparency ▪ Technical Pathway ▪ Generalist Pathway
• Retention and advancement of women	
• Promotion processes	
• Organisational policies	▪ Flexible work
• Organisational change	
• Institutionalised structures, organisational norms	
• Work processes	
Theme 7: Pathways to Manager and Leader	
• Early roles	<ul style="list-style-type: none"> ▪ Various and diverse roles ▪ Exposure to managerial work ▪ Site work ▪ Impact of early career roles
• Transition point	<ul style="list-style-type: none"> ▪ Defined point ▪ Unexpected ▪ Gradual, evolution ▪ Decision point
• Becoming a Manager (subsequent roles)	<ul style="list-style-type: none"> ▪ Oscillation ▪ Building managerial experience ▪ Feet in both camps ▪ Best of both worlds ▪ Returning to technical ▪ Diversifying / broadening ▪ Accepted pathways
• Full-time to Part-time	<ul style="list-style-type: none"> ▪ Part-time Manager ▪ Performance

	<ul style="list-style-type: none"> ▪ Progress ▪ Organisational support
<ul style="list-style-type: none"> • Mobility 	<ul style="list-style-type: none"> ▪ Overseas or interstate moves ▪ Moving to other organisations ▪ Moving within organisations
<ul style="list-style-type: none"> • Move to first managerial role 	<ul style="list-style-type: none"> ▪ In early career ▪ Solid grounding
<ul style="list-style-type: none"> • As a Manager 	
<ul style="list-style-type: none"> • Planned / Unplanned 	
<ul style="list-style-type: none"> • Economic Climate 	
<ul style="list-style-type: none"> • Developing Leadership 	
Theme 8: Influence of Gender on Career and Advancement	
<ul style="list-style-type: none"> • Gender as a disadvantage 	<ul style="list-style-type: none"> ▪ Hard road ▪ Think manager, think male ▪ Slow progression ▪ Missed / disparate opportunities ▪ Harassment ▪ Competence questioned ▪ Extra work from 'gender' activities ▪ Isolation ▪ Dealing with people on site ▪ Limited by gendered relationships
<ul style="list-style-type: none"> • Gender as an advantage 	<ul style="list-style-type: none"> ▪ Different approach / perspective ▪ Using it to my advantage ▪ In later career ▪ Visible / memorable
<ul style="list-style-type: none"> • Gender makes no difference 	
<ul style="list-style-type: none"> • Questioning the impact 	<ul style="list-style-type: none"> ▪ Spectre of positive discrimination
<ul style="list-style-type: none"> • Motherhood 	<ul style="list-style-type: none"> ▪ Challenges and changes <ul style="list-style-type: none"> • Part-time / flexible work • Return to full-time work

	<ul style="list-style-type: none"> • Maternity leave • No impact • Judgements and opinions of others • Changing challenges as children grow <ul style="list-style-type: none"> ▪ Managing motherhood and work <ul style="list-style-type: none"> • Choice, compromise and juggle • Having flexibility and autonomy • Drawing on support networks • Spouse • Nanny or domestic help • Company support ▪ Career progress and ambition <ul style="list-style-type: none"> • Stale mate • Promoted • Developing new skills ▪ Timing
<ul style="list-style-type: none"> • Negotiating gender 	<ul style="list-style-type: none"> ▪ Proving myself ▪ Accepting the status quo ▪ Being tough and strong ▪ One of the boys ▪ Standing up for myself ▪ Change employers
<ul style="list-style-type: none"> • In the minority 	<ul style="list-style-type: none"> ▪ First woman ▪ Only woman ▪ Highly visible ▪ Not many women
<ul style="list-style-type: none"> • Intersectional issues 	<ul style="list-style-type: none"> ▪ Gender and age ▪ Gender and ethnicity ▪ Working with men from other cultures
<ul style="list-style-type: none"> • Role Model and Change Maker 	<ul style="list-style-type: none"> ▪ Leading other women ▪ Creating change

Theme 9: The Technical Link	
<ul style="list-style-type: none"> • Retaining the Link 	<ul style="list-style-type: none"> ▪ Enjoying the technical ▪ Continued technical work ▪ Integrated response ▪ Maintaining technical skill ▪ Return to technical work in the future ▪ Training others ▪ Value of technical knowledge/experts
<ul style="list-style-type: none"> • Technical Competence & Grounding 	
<ul style="list-style-type: none"> • Losing Technical Capacity 	
Theme 10: Impact of Transition on Self	
<ul style="list-style-type: none"> • Adjustments 	<ul style="list-style-type: none"> ▪ Learning and Realisations ▪ Change in Behaviour ▪ Changes Within
<ul style="list-style-type: none"> • Challenges 	<ul style="list-style-type: none"> ▪ Workload / Working Hours ▪ Work Life Balance ▪ Isolation ▪ Control / Ambiguity
<ul style="list-style-type: none"> • Identity 	<ul style="list-style-type: none"> ▪ Manager / Leader Identity ▪ Engineer Identity ▪ Management / Leadership style ▪ Military Identity ▪ Not Fitting the Mould ▪ Gendered Roles
<ul style="list-style-type: none"> • Feelings 	<ul style="list-style-type: none"> ▪ Positive Feelings ▪ Negative Feelings ▪ Reluctant / Ambivalent

Appendix I – Links between Core Themes and Phenomenological Themes

The three core themes that emerged from the data are:

- Individual
- Relational
- Structural

These groupings, and the interfaces between them, describe the influences on the experience of the transition from technical engineer to manager and leader. The three core themes and their connections with the ten phenomenological themes are illustrated in Figure AI-1. A brief description of these connections is provided below.



Figure AI-1 – Relationships between Phenomenological Themes and Core Themes

Individual

The first core theme relates to the Individual. Figure AI-2 illustrates the phenomenological themes that inform the grouping of “Individual”.

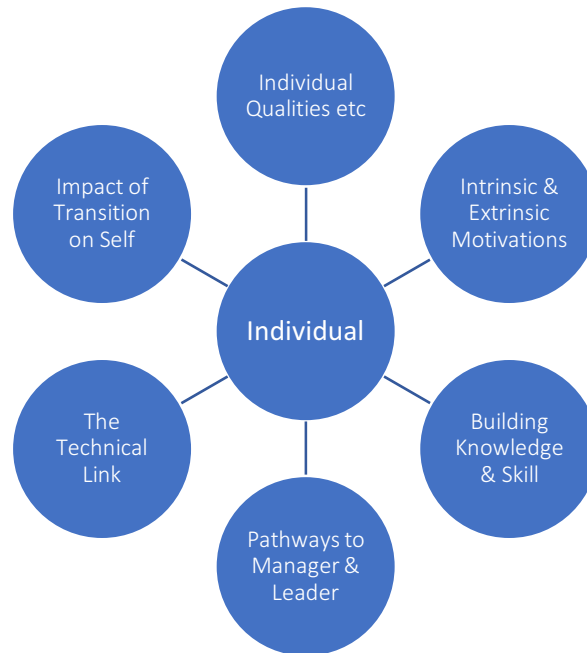


Figure AI-2 – Individual Core Theme

A woman’s transition from engineer to manager and leader is influenced by her (1) *individual characteristics, abilities and preferences*. There are aspects of an individual’s personality, her innate preferences and abilities that steer her towards a management role. Self-awareness of these aspects and the desire to find a career role that is congruent with them, or enables the expression of these preferences appears to be key. Deciding to take and choosing to remain in a managerial / leadership role relates to fulfilling individual desires. These (2) *Intrinsic and Extrinsic Motivations* encompass self-actualisation, achieving power, control and influence, and autonomy.

Women prepare themselves for the transition by (3) *Building Knowledge and Skill*. Accumulating knowledge and skill through experience creates confidence and sense of validation of the women’s readiness to pursue senior roles and their perceived ability to enact them. Women’s (4) *pathways to manager and leader* in engineering are varied, characterised by multi-directional movement. Individual

preferences and motivations interface with the influences of organisations and people within in them to shape career pathways. This is particularly the case in the career pathways described as ‘Solid Technical’ or ‘Broadening’, for women choosing to return to technical roles as a matter of preference, and for women moving away from organisations that do not align with their values.

Rarely is there a sharp division between a technical role and a managerial or leadership role. Instead it is common for women to maintain a (5) *Technical Link* as their careers progress. For some women, this is associated with individual preference, enjoyment and satisfaction derived from technical work. For others, the technical realm is a safe and comfortable space.

Moving to a management role invokes intense feelings and personal change. The (6) *Impact of the Transition on Self* encompasses feelings, changes in perception, thinking and behaviour, increased self-awareness and identity development. These elements of the experience highlight that role transition extends beyond the change in title and job description.

Relational

The second core theme of “Relational” groups themes related to the influence of other people on the women’s transition experience, as illustrated in Figure AI-3.

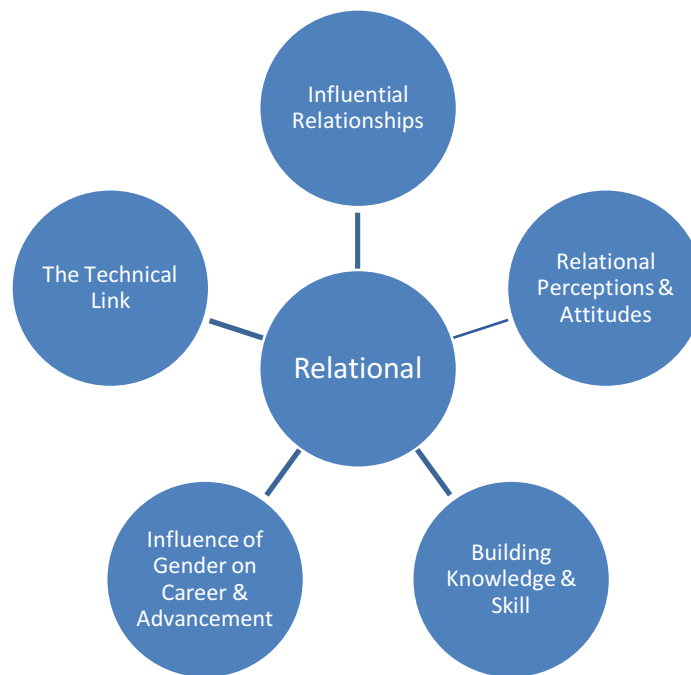


Figure AI-3: Relational Theme Grouping

The women in this study described (1) *Influential Relationships* with people in their workplaces and broader social settings. These relationships included those classified as coaching and mentoring relationships, role models, networks that provided support and opportunity, and workplace relationships with superiors and team members. These relationships were the source of (2) *Relational Perceptions and Attitudes* that include subjective judgements, evaluations and classifications bestowed by others onto the individual. The women’s stories revealed the influence of these perceptions and attitudes on their transition to senior roles.

Other people in the workplace were a source of knowledge. Women in this study described how they leverage their relationships with others, particularly team members and experienced para-professionals, to access knowledge in their quest to (3) *Build Knowledge and Skill*. Linked to the subjective perceptions and attitudes of others, was the value placed on technical expertise and competence. Many women maintained a (4) *Technical Link* during their transition to managerial roles as a means of establishing and maintaining credibility and value with their teams and with their peers.

The women's transition experiences occurred within the context gendered workplaces and the (5) *Influence of Gender on Career and Advancement* is apparent. Interactions and relationships in the workplace are coloured by gendered roles and stereotypes, and by women engineer's heightened visibility from the beginnings of their careers. Many women in this study stated that they did not feel that their gender made a difference to their careers. However, descriptions of paternalistic relationships, assumptions by others of availability for or interest in opportunities that serve to limit prospects, and the need to prove competence and capability by working harder indicate that gender did have an impact. When in management and leadership roles, women engineers encounter stereotypes associated with managerial and leadership roles – typically the “think manager, think male” expectation. The influence of gender on career and advancement through interpersonal means was magnified for women engineers that become mothers and managers.

The women in this study could negotiate the gendered roles, relationships and interactions encountered along the route to senior roles. Women drew on networks for support, for solidarity and for a sense of belonging. They purposefully shaped gendered relationships to their advantage, and drew on their difference as a benefit. However, gendered tensions persisted into senior management and leadership roles.

Structural

The final core theme of “Structural” clusters themes that relate to the influence of the organisation, the engineering profession and broader society on the women's transition experience. This cluster is illustrated in Figure AI-4.



Figure AI-4 – Structural Theme Grouping

Through structure, policies, process and culture (1) *The Organisation* acted as both a provider of opportunity, and as a constraint to women’s advancement. The influence of the organisation on the transition to manager was realised through its definition of promotion pathways and processes, policies governing modes of work and organisational hierarchical status. The climate and energy of the workplace is a product of the workplace culture. Women experiencing an incompatibility with workplace culture demonstrated a willingness to move on and seek alignment elsewhere. A variety of (2) *Pathways* were taken by women as they advanced to managerial and leadership roles. The opportunity to take the first managerial or leadership role, was more frequently influenced by the organisation. The sense of multi-directional movement observed in these pathways reflected their negotiation of structural elements. Movement between full-time and part-time work, management and technical roles, to temporary and unofficial roles and between organisations were often reactions to organisational policy (particularly relating to engineering mothers), workplace culture and the project based nature of much of engineering work.

The organisation enabled (3) *Building Knowledge and Skill* through the provision of developmental experiences and formal professional development. Many

women chose to maintain a (4) *Technical Link* as a career strategy. A strong bond to technical knowledge granted them mobility and enabled them to negotiate structural barriers to remaining in or progressing to higher managerial roles while maintaining career continuity. In addition, the occupational culture of engineering placed high value on technical knowledge, and thus a technical link reinforced the professional engineering identity and cemented their fit in the profession.

In addition to colouring relationships and interpersonal interactions, the (5) *Influence of Gender on Career and Advancement* was also manifested through the gendered nature of organisational work environments and policy execution. Within organisations, advancement pathways were tied with masculine concepts of success. Long hour cultures were prevalent; career progression was associated with linear, full-time employment. 'Family-friendly' policies aimed at assisting women to accommodate family and caring responsibilities enabled part-time or flexible employment. This enabled continued employment, however in organisations where success was equated with full-time employment utilisation of these policies occurred a cost for women. Further, in some organisations, management and leadership roles were excluded from part-time work, creating a constraint to women's career progression. The influence of gender at the organisational level was also evidenced through differential access to site-based work.

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